1998 Colorado River Boater Study, Grand Canyon National Park

Troy Hall
Virginia Tech, Department of Forestry

Bo Shelby,
Oregon State University, Department of Forest Resources

June 15, 2000

Prepared for Grand Canyon Association
And Grand Canyon National Park

Acknowledgements

Many people made this study possible. Grand Canyon National Park, especially Linda Jalbert, assisted with logistics and administrative requirements, and Laurie Domler provided assistance gathering data on use. Mark Grisham, from Grand Canyon River Outfitters Association assisted with arrangements for commercial trips. Grand Canyon Private Boaters Association and the Grand Canyon River Outfitters Association provided comments on draft questionnaires and discussed issues important to them.

Many individuals helped with data collection. We would like to thank Michelle Adcock, Melanie Bell, Jason Dedrick, Al Gunter, Kirk Gerhardt, Steve Haas, Hallie Henderson, Bev Heumann, Mark Jewell, Steve Martin, Jeff Matthews, Ashley Pryor, David Richert, David Robertson, Patrick Teague, and Dave White for their assistance.

We are especially grateful to the many boaters, guides, and outfitters who graciously accepted our presence on trips and took time to complete questionnaires.

Table of Contents

List of Tables

Findings, Conclusions, and Recommendations

Pages

4 Objectives: This study was designed to obtain information about boaters' experiences, and especially how social conditions affect experiences. One goal was to evaluate conditions (encounters) in relation to NPS management standards. Another was to replicate a 1975 study to assess how conditions and visitor attitudes had changed.

8-16 Methods: Observational and survey data were obtained during a 1998 random sample of 48 trips, including commercial, private, motor, and oar trips. Observers recorded information on encounters on the river, at attraction sites, and at camps. Surveys elicited information from visitors on their characteristics, their expectations, factors affecting trip quality, and attitudes toward management alternatives. Data were collected on more than 1,900 individual encounters, across more than 500 observation days. Survey data were collected from 472 commercial motor trip passengers, 451 commercial oar trip passengers, 124 private boaters, and 100 commercial guides.

31-39 Finding: Across all trips, the average encounter lasted 9 minutes; the median length was 5 minutes. Encounters with oar trips on average were 11 minutes; encounters with motor trips were 7 minutes on average. Motor-motor encounters were shortest, at 6 minutes; commercial oar - commercial oar encounters were longest, at 20 minutes, and private - private encounters were intermediate, at 10 minutes. More than 40% of all encounters were with groups seen previously during the trip.

39-43 Finding: Across all trips, on the average day, boaters encountered 2.7 different groups with 3.6 separate encounters. Total time in sight of others averaged about 30 minutes per day when on the river (not including encounters at attraction sites or camps). On commercial motor trips, boaters had an average of 5 encounters per day, compared to 3 for commercial oar and private trips.

44 Finding: The average number of on-river encounters per day was 4.2 in June, 3.8 in July, 4.1 in August, 3.4 in September, and 2.2 in October.

45-46 Finding: Half of trips had at least one day with no river encounters at all (though they may have had encounters at attraction sites or camps on those days). Most trips had at least one day with more than 5 on-river encounters.

Pages

47-50 Finding: On average, commercial motor trips stopped at 1.8 sites per day, while commercial oar and private trips stopped at 1.3. Although several sites were visited by all trips, different trip types were likely to stop at different places. The only attractions where more than 70% of all trips stopped were Deer Creek, Elves Chasm, and Redwall Cavern. The average length of all stops was 1.8 hours.

52 Finding: At most attractions, most trips saw no one. Encounters were especially uncommon (<50% of the time) at Blacktail, Clear Creek, Matkatamiba, National, Pumpkin Springs, Shinamu Creek, South Canyon, Unkar Delta, and the Whitmore petroglyphs. The highest odds of meeting others occurred at Deer Creek (94%), Havasu (97%), Phantom (97%), and Tapeats Creek (92%).

57-61 Finding: The most popular camps, used by at least 10 of the sampled trips, were Bass, Nankoweap, National, North Canyon, Saddle Canyon, and 220 Mile. On approximately 20% of all nights, boaters camped within sight or sound of another trip. On a per-trip basis, 32% of commercial motor, 18% of commercial oar, and no private trips had complete solitude on every night.

66-67, 73 Finding: Grand Canyon boaters, especially commercial passengers, are not representative of the US population. 18% of commercial passengers have a Ph.D. or equivalent, compared to 6% of private boaters and 1% of the US population. 45-50% of commercial passengers have incomes above $100,000, versus 14% of private boaters and 12% of the US population. Boaters in general are much more outdoor-oriented that most Americans; for example on 5% of Americans enjoy mountain climbing, but 50-75% of boaters do so.

74-75 Finding: 80% of commercial passengers were on their first Colorado River trip, compared to 39% of private boaters. 27% of commercial oar and 38% of commercial motor passengers were on their first trip on any river; 94% of private boaters had been river-running before.

86 Finding: There were several differences between types of boaters in perceptions of wilderness qualities in the Grand Canyon. For example, 90% of all commercial passengers "would consider the Grand Canyon a wilderness," but only 56% of private boaters would do so. Half of private boaters, but only 20% of commercial passengers, feel the canyon is too crowded to be considered wilderness. More than 70% of commercial oar and private boaters feel he canyon would be more of a wilderness if motors were banned, but only 24% of commercial motor passengers agreed.

Pages	
97-98	Finding: Among commercial passengers, length of trip, available dates, and type of boat were factors considered by more than 50% when choosing their trips. Factors such as food, equipment, and safety were less important.
100-101, 119	Finding: People on rowing trips (commercial oar and private) almost unanimously (93-99%) prefer to take oar trips, while commercial motor passengers either prefer motor trip (62%) or are indifferent (28%). The primary reasons for preferring oar trips are quiet, environmental impact, and a feeling of naturalness. The primary reasons for preferring motor trips are safety and efficiency (seeing the canyon in less time). Seeing motor-powered watercraft was a problem for commercial oar and private boaters during their trip; on average they rated such encounters as detracting (-1.4 to -1.6 on a scale from +3 to -3).
140	Finding: Consistent with preferences for one's own trip type, 84% of commercial oar and 93% of private boaters prefer to meet oar trips, whereas 81% of commercial motor passengers said the type of trip encountered makes no difference. Most motor passengers (80%) would prefer to meet a motor trip that passes quickly than an oar trip that passes slowly, but 83% of commercial oar and 71% of private boaters prefer the latter.
103-104, 142-144, 148	Finding: Most boaters, even those in large (>30) groups, prefer to boat the river in smaller groups. All private boaters, 81% of commercial oar passengers and 56% of commercial motor passengers would prefer to boat the river with 20 or fewer others. Most also prefer to meet small groups. When forced to choose between meeting several small or fewer large groups, commercial passengers were almost split, but 62% of private boaters prefer the former. More than 80% of all groups feel there should be a limit on group size; the median numbers suggested were 30 (commercial motor), 24 (commercial oar), and 20 (private).
109, 153	Finding: All boaters are strongly opposed to new developments of any sort, and groups did not differ on these items. More than 80% oppose various potential campsite improvements.
110	Finding: 85% of private boaters and 73% of commercial passengers "frequently" or "often" experienced solitude on the river. 70-74% of commercial boaters and 53% of private boaters say Grand Canyon is better than other rivers in providing solitude.

Pages	
130, 133-134	Finding: 85% of private boaters, 74% of commercial oar passengers, and 42% of commercial motor passengers reported feeling at least slightly crowded, using a common 9-point scale. However, about 80% of commercial boaters and 53% of private boaters agreed that "we didn't meet too many people" on the river. Less than 30% of commercial boaters but 66% of private boaters felt that "too often they had to share attraction sites" with others.
117	Finding: Most (70-80%) of commercial passengers believe the Grand Canyon is "not being damaged by overuse," and only 23-31% of these people thing overuse of attraction sites is a problem. However, 67% of private boaters think overuse of attractions is a problem and only 42% think the environment is not being damaged. Thus, there is a large difference between private and commercial boaters.
125-126, 128, 145	Finding: Although about 45% of commercial oar and private boaters prefer to meet no other trips during a day on the river, 41% of commercial oar passengers and 49% of private boaters prefer to meet 1 to 3 other groups. Motor passengers were less likely to prefer no encounters (25%), and 41% of this group prefer 3 to 5 encounters per day. On the busiest day of their trips, on average, commercial passengers reported seeing about 5 other groups and private boaters reported about 6. Using these data, 64% of commercial motor, 79% of commercial oar, and 93% of private boaters saw more than they preferred, on at least one day of their trip. However, 41% of commercial motor, 53% of commercial oar, and 43% of private boaters reported having a day with no encounters at all.
136-140	Finding: In questions asking about personal standards for a wilderness-type experience on the Colorado River, 43% of commercial motor, 63% of commercial oar, and 68% of private boaters stated a maximum acceptable number of groups that could be camped in sight or sound. For those stating a number, the median was 1. For a question about the acceptable number of encounters per day, 41% of commercial motor passengers, 60% of commercial oar passengers, and 71% of private boaters stated a maximum acceptable number; for these individuals the median was 2-3. For percent of time in sight of other groups, 62% of motor, 71% of commercial oar, and 85% of private boaters stated a maximum number. The median response among all groups was that 10% is the maximum acceptable amount of time in sight of others.
145	Finding: 79% of private boaters prefer to meet private trips on the river over commercial trips. Although 64% of commercial motor and 57% of commercial oar passengers say it makes no difference, about one-third of these boaters prefer to meet commercial trips.

Pages

146-7 Finding: Many boaters (50-68%) would accept less flexible scheduling of trip departure dates to achieve preferred encounter levels, and 44-50% would be willing to follow a more strict schedule during the trip. However, most are not willing to wait two years longer to take a trip. Most also would not be willing to miss some attractions in order to guarantee fewer encounters at other sites.

150-152 Finding: At least 80% of all boaters disagree that "reducing crowding is not as important as making sure people can see this unique place," suggesting that crowding ultimately is something that to which the NPS should attend. However, there was no consensus about what the NPS should do if crowding reaches unacceptably high levels. Most do not support reducing the number of launches, shifting use to the off-season, requiring tight schedules, or increasing fees.

153-155 Finding: Most boaters support the use of quieter motors on the river and at least 50% support increasing the number of winter trips. Most oppose the idea of increasing the overall number of trips allowed.

159-161 Finding: Management standards for the river for the high-use season stipulate that there should be an 80% probability of having 7 or fewer encounters per day and 90 minutes or less in sight of others. At attractions, there should be an 80% probability of contacting groups at 70% of sites, but it is acceptable to have encounters all the time at the Little Colorado, Elves Chasm, Deer Creek, and Havasu. At camps, there should be no more than a 10% probability of camping within sight or sound of others.

169-174 Finding: Using observer data (which recorded more encounters than visitors recall), on a per-day basis commercial motor passengers had 7 or fewer encounters on 73% of days, versus 94% of days for commercial oar passengers and 91% for private boaters. By this measure, commercial motor trips appear slightly out of compliance with standards, whereas commercial oar and private trips are within standards. On a per-trip basis, 41% of commercial motor, 0% of commercial oar, and 13% of private trips spent more than 20% of their days having more than 7 encounters. Again, commercial motor trips are out of compliance, but commercial oar and private trips are within standards. More than 90% of all days on all trips were in compliance with the standard of 90 minutes in sight of others (assuming the standard does not include attraction sites or camps). Encounters at attraction sites appear to be well within what is acceptable according to management standards. For trips stopping at the Little Colorado, Elves Chasm, Deer Creek, and Havasu, the chances of meeting people at all of them ranged from 41 to 59%. All three trip types were slightly out of compliance with the NPS standard for camp encounters.

Pages

176-180 Finding: In 1975 there were 562 trips; in 1998 there were 913. The greatest increase was in the number of private trips. The mean number of river encounters per day increased only slightly, and the amount of time in sight of others did not change for commercial motor trips and declined slightly for commercial oar and private trips. The proportion of attractions at which others were encountered increased slightly, from 46% to 50-55%.

184-193 Finding: Commercial motor passengers were very similar in 1998 to those in 1975 in preferences for trips, perceptions of conditions, and evaluations of encounters. Private boaters have become more "purist" -- being more sensitive not to impacts and crowding. Commercial oar passengers, who have always been intermediate between commercial motor and private boaters, in 1975 were more like private boaters, especially in their views on wilderness qualities, motors, and encounters. In 1998, though still intermediate, they had become more like commercial motor passengers. These findings suggest that the gulf between private and commercial boaters has deepened over time.

Chapter 1: Introduction

This report presents the findings of sociological research conducted in 1998 to support management planning for the Colorado River through Grand Canyon National Park. This study dealt only with river runners. Observers accompanied a random sample of river trips, documenting trip logistics and encounters among groups. At the end of the trips, observers distributed surveys to passengers and guides, asking about a variety of perceptions and attitudes pertaining to experience quality and river management. This chapter describes the rationale and objectives of the study and the organization of this report.

Purpose of the Study

Quality recreation management requires understanding the patterns of use of a resource as well as users' views on the way use levels, encounters, and other factors enhance or detract from experience quality (Shelby and Heberlein 1986; Manning 1986). The Colorado River through Grand Canyon National Park provides a unique recreational opportunity, and ensuring high quality recreation through superior management is especially important. This study provides information directly applicable to the river management planning process by identifying the type of experiences currently provided, visitors' desired/preferred types of experiences, the level of agreement among managerially relevant segments of the user population, several indicators that can be used to monitor experience quality, visitor perspectives on standards of quality for each indicator, and visitors' views on the appropriateness of possible management actions or policies.

The 1989 Colorado River Management Plan (CRMP) stipulates that the river should be managed to provide opportunities for solitude, quiet, and ability to avoid crowded sites. It identifies several factors that influence experience quality, including group size, trip length, visitor expectations, the number of river encounters per day, the amount of time in sight of other boaters, the number of encounters at attraction sites, guide qualifications, and beach camp quality and size. This list was based on research conducted by Shelby and Nielsen in 1975.

A review of the CRMP, the National Park Service (NPS) River Contact Survey and Attraction Site Monitoring Status Reports of 1990 and 1991, and comments solicited from researchers following a 1995 NPS fall river trip raised the issue of needed sociological research and monitoring in the Grand Canyon. Although several studies had been conducted in the past, the imminent revision of the CRMP, new developments in sociological recreation research methods, and the length of time that has passed since the last systematic research all suggested the need for additional research. In particular:

1. Much of the past research was done between 15 and 25 years ago, and it is possible that visitor perceptions, concerns, and attitudes have changed. Longitudinal studies in recreation settings are quite rare, and we do not know how rapidly visitor sentiments change. Aspects of use patterns (such as the number of trips, type of trips, and number of trips with exchanges), of the site (such as beach availability), and of the visitors (level of experience or environmental attitudes) have changed since the 1970s, and these changes may have translated into different perceptions and attitudes about Grand Canyon and management of the Colorado River. This study provided an opportunity to replicate and extend a study conducted 23 years previously, giving valuable insight into the ways the river experience and river users may have changed over time.

2. New techniques for obtaining visitor input (for example, the use of visual aids and different question formats) have recently been developed, and we felt that these might provide unique or different insights about Colorado River users and experiences. In particular, research on understanding visitor preferences and standards for encounters, and their perceptions of wilderness qualities, have been substantially refined since the original research in 1975 (see, for example, Hall et al. 1996; Hall & Roggenbuck 1998; Roggenbuck et al. 1991).

3. Changes in management and in use patterns may have altered the nature of the visitor experience since the last monitoring was performed. The NPS strives to keep encounters to low levels and various formal and informal efforts to do so have been undertaken. In particular, adjustments to launch scheduling may have reduced the number of encounters between trips on the river. Awareness of the issue of encounters may also have influenced the way guides lead their trips, which in turn may influence the number of encounters they have with others. According to knowledgeable individuals, including many guides, trip leaders work to avoid congestion at popular attractions and camps.

4. There was a perceived need to obtain representative, scientifically valid data on conditions experienced by river runners for use in revising the CRMP and in managing the river. Data collected by river rangers using convenience sampling may not be sufficiently valid or representative for these purposes.

5. The CRMP details specific standards of quality for river trips, which generally pertain to encounters among groups. There was a perceived need to evaluate how actual conditions comply with these standards and also to evaluate the standards themselves against visitor opinion.

The specific objectives of the study were:

1. To evaluate ways that the visitor experience and visitor characteristics have changed since 1975, looking specifically at the nature, number, location, and duration of encounters between river users and visitors' evaluations of experiences;
2. To understand how Colorado River runners define and conceptualize "wilderness;"
3. To understand what type of experience river users believe the Colorado River now provides, and what type of experience they think it should provide;
4. To evaluate the current indicators of experience quality, the standards for each indicator, and the acceptability of alternative techniques that might be used to maintain conditions within standards;
5. To understand visitor support for different management actions, including the trade-offs they are willing or unwilling to make between experience quality and access to the river.

Organization of the Report

Several complex data sets emerged from this effort. For ease of presentation, the different types of data are presented in different chapters. Chapter 2 (Methods) describes sampling,

development of data collection instruments, and procedures used to collect attitudinal data from boaters as well as observational data about trips and encounters.

Chapter 3 describes the trips sampled for this study, including information about attraction site stops and camp locations. Group sizes, time on the river, and other features of trips are presented. The majority of the chapter presents observers' data on encounters, including information about individual encounters (e.g., duration and type), as well as information about the total number of encounters on the river each day. Separate data are presented for encounters at attraction sites and at camps.

Chapter 4 presents results from the boater surveys. This contains information on visitor characteristics (demographics, recreation preferences, river experience, and ideas about wilderness); planning for the river trip (motives, advance planning time, and factors important in selecting commercial trips); perception of wilderness qualities in the Grand Canyon; perceptions of environmental impacts in the Grand Canyon; evaluation of trip quality (pace, opportunities for off-river activities, weather, guides, level of development, comparison with expectations, features and conditions encountered, comparison with other rivers, and personal benefits); social conditions (recall and evaluation of encounters, expectations, preferences, and crowding); preferences for Grand Canyon experiences (preferred trip types, group sizes, types of encounters, numbers of encounters, and willingness to adjust to obtain desired experiences); and opinions about river management (group size limits, actions to reduce crowding, and other policies or actions).

Data from the survey are presented separately for commercial motor, commercial oar, and private boaters. Guides completed a shortened survey, and data for them are presented

separately as well. Statistical comparisons among groups allow us to draw general conclusions about differences among the different types of respondents.

Chapter 5 synthesizes and discusses findings related to social conditions (i.e., encounters and crowding) on the river. Existing NPS standards are described and evaluated relative to visitor input about acceptable conditions and to current encounter levels. This chapter also includes research findings from other rivers to explore ways in which the Grand Canyon is similar to or different from other settings.

Chapter 6 uses survey questions asked in both the 1998 and 1975 surveys to explore ways in which the river experience and users have changed over time. Of particular interest are changes in objective conditions (i.e., encounters) and changes in visitor perceptions of conditions, impacts, and crowding.

Chapter 2: Methods

Overview

This research involved two components: observational data describing trips (namely, trip schedule, locations stopped, and encounters) and attitude and preference data describing boaters, collected via written questionnaires. One purpose of the study was to evaluate the extent to which social conditions (i.e., river contacts, attraction site encounters, and camping solitude) meet Park Service standards. The observational data help answer that question (see Chapter 3 for results and Chapter 5 for additional analysis). Another purpose was to understand how boaters themselves evaluate their trips, conditions they encountered, and different management alternatives. Survey data addressed these questions. Finally, an important goal was to understand whether and how conditions and visitors have changed over time. Data were available from Shelby and Nielsen's 1975 study of boaters and trips. Our data collection procedures and many survey questions were designed to match those of the earlier study, to ensure valid.

This chapter describes how sampled trips were selected and compares 1975 and 1998 sample characteristics. This is followed by a section describing the procedures for collecting observational data. The final section describes the development and administration of the questionnaire.

Sampling

Trip Selection and Distribution of Trips in 1975 and 1998

As in 1975, the sample of trips was selected to ensure representativeness, but also to capture variation in use levels, mode of propulsion (motor or oar), and type of trip (commercial vs. private). To do this, trips were apportioned across the months, with random sampling within each month. Although the study period in 1975 was from April through September, in 1998 sampling began in June, but continued through October. Thus both years included some trips during the shoulder season, but the timing of those trips (April vs. October) differed.

In 1975, about 20% of commercial use occurred in each month between May and August, with substantially less use in September and very little in April (Table 2.1). In 1998, June and July each had about 30% of all commercial use, while August had 23% (Table 2.2). The 1998 proportion of use in September was similar to the proportion in 1975, and October of 1998 was similar (3% of use) to April in 1975 (4% of use).

Only 45 private groups boated the Colorado River in 1975, and their trips were fairly uniformly distributed across the months from April through August. In 1998, eight private trips were permitted each week (one a day with two on Wednesdays). There was a total of 159 private trips during the study season. Thus, overall use by private boaters increased considerably between the two study periods, but the distribution of use across months remained generally consistent.

Table 2.1 Distribution of All Trips and Sampled Trips During the Study Period in 1975[1]

	Type		April	May	June	July	Aug.	Sept.	Total
Commercial	Population	*n*	20	93	123	112	112	57	517
		%	4	18	24	22	22	11	100
	Sample	*n*	3	5	13	8	6	4	39
		%	8	13	33	21	15	10	100
Private	Population	*n*	7	8	10	7	9	4	45
		%	16	18	22	16	20	9	100
	Sample	*n*	na	na	2	1	3	1	7
		%	na	na	29	14	43	14	100
Total	Population	*n*	27	101	133	119	121	61	562
		%	5	18	24	21	22	11	100
	Sample	*n*	3	5	15	9	9	5	46
		%	7	11	33	20	20	11	100

[1]Source: Shelby & Nielsen (1976)

Table 2.2 Distribution of All Trips and Sampled Trips During the Study Period in 1998

	Type		June	July	Aug.	Sept	Oct.	Total
Commercial	Population	*n*	144	154	116	66	14	494
		%	29	31	23	13	3	100
	Sample	*n*	12[1]	7	11	6	3	39
		%	31	18	28	15	8	100
Private	Population	*n*	32	32	34	33	28	159
		%	20	20	21	21	18	100
	Sample	*n*	2/4[2]	2	1	1	2	8/10
		%	25/40	25/20	13/10	13/10	25/20	100
Total	Population	*n*	176	186	150	99	42	653
		%	27	28	23	15	6	100
	Sample	*n*	14/16	9	12	7	5	47/49
		%	30/33	19/18	26/24	15/14	11/10	100

[1]Observational data are available for all trips. On one trip, the observer was unable to hand out questionnaires, so the number of trips with survey data was 11.

[2]One trip had an observer but no surveys; 3 trips had surveys but no observers; 1 trip had both. Thus, there were 2 trips with observers and 4 trips with survey data in June. The final sample included 47 trips with observational data and 49 trips with survey data. Figures are presented as (observer trips)/(survey trips)

As in 1975, the number of trips to be selected from each month was determined separately for commercial and private trips. In 1975, 46 trips were sampled, with 39 commercial and 7 private trips. As can be seen in Table 2.1, sampling of private trips in that year did not begin until June, but in 1998 private trips were included for each month of the study (Table 2.2). In 1998, approximately the same number of trips was targeted as in 1975, distributed in the same proportions across months and type (commercial vs. private). This allowed us to compare responses across years, ensured adequacy of sample sizes for each type of trip, and was the maximum possible sampling intensity given staffing and resources.

Within each month, the launch dates were randomly selected for each type of trip (commercial or private), and no two sampled commercial trips could launch on the same day. Within a sampled day, the specific trip (if it was a commercial trip) was randomly selected from all trips launching that day. Random selection of trips from the commercial stratum was used to ensure a representative sample of commercial oar vs. motor trips, so no prior stratification was done on that variable. With few exceptions, commercial trips were selected without difficulty. The Grand Canyon River Outfitters Association had agreed ahead of time to participate in the project and they permitted observers to accompany trips at the cost of reimbursement for food. On three occasions, the outfitter expressed some reason that having an observer along would have caused difficulties, and in place of these trips, we selected the most similar type of trip available on or near the sampled date.

Selection of private trips proved somewhat more difficult. When trips were sampled, trip leaders were contacted, first by letter from the National Park Service and then by phone by the research team, to ask if they were willing to participate. An incentive (waiver of the $200 launch fee) was offered to encourage participation by private boaters. Nevertheless, several groups

were understandably reluctant to have an unknown observer accompany them, and declined to participate. When this occurred, another private trip was randomly selected within the same month, and the process began again. Approximately half of the private trips initially selected agreed to participate.

There were unusual arrangements with a few private trips. Three of the randomly selected trips wished to participate in the survey but not take an observer. In two of these cases, surveys were mailed to participants, and in the third, the surveys were given to one trip member, who distributed them at the end of the trip and mailed them to the research team. In another case, a trip leader not from a sampled trip volunteered to collect observational data. Because this trip was not randomly selected, no survey information was collected. (These variations account for the different number of private trips for survey and observational data in Table 2.2.) However, we felt that the information on encounters and trip schedule was unlikely to be different for volunteer versus randomly selected trips, and therefore the observational data from that trip were used. Toward the end of the study season, as we were experiencing difficulty arranging private trips, we accepted offers from two groups to take observers. Both observational and survey data were collected during these two trips. Observers felt that in general these trips were not particularly different from the other private trips included in the study. The final private boater sample included 47 trips for observational data and 49 trips for survey data.

Characteristics of Sampled Trips

Table 2.3 compares the sampled trips from 1975 and 1998. (In this presentation, and in subsequent tables, two commercial oar trips that had motor support are included with the oar

trips.) One obvious difference is the proportion of motor trips among the commercial trips. In 1975, 82% of commercial trips sampled were motorized, and this was fairly close to the proportion in the total population of trips that year (78% of all trips, and 85% of commercial trips, were motorized). In 1998, however, only 56% of sampled commercial trips were motorized. Across all trips in 1998, there were 260 private trips, 155 commercial oar trips, and 498 commercial motor trips. Thus, 55% of all trips and 76% of commercial trips were motorized in that year. These differences in sampling between 1975 and 1998 resulted in a more equal distribution of respondents across commercial oar and motor trips in 1998, with about the same total number of private boaters in each year.

Table 2.3 Comparison of 1975 and 1998 Samples

		Commercial		
	Year	Motor	Oar	Private
Number of Trips	1975	32	7	7
	1998	22	17	8/10[1]
Number of Respondents	1975	702	127	117
	1998	472	451	124

[1]8 trips with observers; 10 trips with survey data.

Specific information about 1998 sampled trips is provided in Table 2.4. Similar information for 1975 trips can be found in Shelby and Nielsen (1976). Each of the 16 outfitters had at least one sample trip, and the proportion was close to the proportion of allocation. For example, there were five trips with Grand Canyon Expeditions, one of the larger companies. Trip sizes varied from 11 to 38 passengers. (Numbers indicate the size of trips as they left Lees Ferry; sizes sometimes changed following exchanges at Phantom Ranch or Whitmore Wash.) Trip lengths varied from 7 to 18 days. Total length indicates the number of days from Lees

Ferry to the last place where passengers disembarked. Information in the column 3 indicates the number of days for each segment of the trip. For example, "5P 8L" indicates that a trip that was a total of 12 days offered a 5-day trip from Lees Ferry to Phantom Ranch and an 8-day trip from Phantom to Lake Mead. The possible points of disembarkation were Phantom Ranch ("P"), Whitmore Wash ("W"), Diamond Creek ("D"), and the lake ("L").

Table 2.4 Trip Length, Size, and Type for Trips Sampled in 1998

Departure Date	Total Days	Exchange Information	Outfitter	Trip Size (passengers + crew)[1]	Trip Type
June 1	8	6W 3L	TOUR	12+2	Motor
June 2	7	7W	Hatch	26+3	Motor
June 3	7	7W	WRAD	22+4	Motor
June 4	15	15D	CAEX	22+6	Oar
June 6	8	8L	COLO	12+2	Motor
June 8[2]	18	18D	Private	13	Oar
June 9	8	6W 3L	Western	33+4	Motor
June 10[3]			Private		Oar
June 10[3]			Private		Oar
June 12	8	8L	GCE	16+1	Motor
June 14	15	5P 8W 4L	OARS	25+8	Oar
June 15	12	5P 8L	OUTD	21+6	Oar
June 22	8	6W 3L	TOUR	11+3	Motor
June 24	16	16D	Private	13	Oar
June 26	14	14L	GCE	17+7	Oar w/ motor
June 27[4]	18	18D	Private	11	Oar
June 29	8	4P 5L	WRAD	25+4	Motor
July 1	7	7W	Hatch	38+4	Motor
July 3	14	6P 8D	Moki	20+5	Oar
July 7	8	8D	Diamond	26+4	Motor
July 12	8	8L	ARR	24+6	Motor
July 13	18	18D	Private	12	Oar
July 15	14	14D	CAEX	17+6	Oar
July 19	7	7L	CANY	20+2	Motor
July 21	8	6W 3L	WRAD	38+4	Motor
July 21	18	18D	Private	16	Oar
Aug. 1	8	8W	ARR	26+3	Motor
Aug. 2	7	7W	Hatch	12+2	Motor
Aug. 7	15	15D	Private	11	Oar

Table 2.4 Continued

Departure Date	Total Days	Exchange Information	Outfitter	Trip Size (passengers + crew)[1]	Trip Type
Aug. 9	8	4P 5D	Diamond	25+4	Motor
Aug. 11	12	5P 8D	CAEX	28+7	Oar
Aug. 13	12	5P 8L	OUTD	21+6	Oar
Aug. 14	8	8L	GCE	12+2	Motor
Aug. 17	13	6P 8D	AZRA	21+5	Oar
Aug. 19	8	6W 3L	Western	35+6	Motor
Aug. 25	11	5P 7W	HDA	19+5	Oar
Aug. 27	16	6P 8W 4L	OARS	38+8	Oar
Aug. 30	7	7L	CANY	15+4	Motor
Sept. 4[5]			OUTD	24+6	Oar
Sept. 5	8	8L	GCE	16+2	Motor
Sept. 9[6]	16	16D	Private	15	Oar
Sept. 11	8	8L	GCE	14+1	Motor
Sept. 13	9	9W	ARR	27+3	Motor
Sept. 14	10	10W	Diamond	24+7	Oar w/ motor
Sept. 21	14	14D	AZRA	20+8	Oar
Oct. 14	13	13D	HDA	12+3	Oar
Oct. 3	18	18L	Private	16	Oar
Oct. 5	14	6P 9D	Moki	28+5	Oar
Oct. 8	18	6P 11W 3L	OARS		Oar
Oct. 8[6]	18	18D	Private	14	Oar

[1]At departure from Lees Ferry.
[2]Observer data only; no surveys.
[3]Randomly sampled trips who declined to take observer. Completed surveys by mail.
[4]Completed surveys only, on last day of trip. No observer with trip.
[5]Observer hiked in and met the trip at Phantom.
[6]Volunteer trips (not randomly sampled).

Figure 2.1 depicts the number of trips launching each week for all of 1998. It indicates that the lowest weekly density during the study season was 7 launches from Lees Ferry (104 people), in October, while the highest was 38 launches (628 people), in June. For 1975 river use, Shelby and Nielson (1976) computed density as the total combined boating traffic departing Lees Ferry for the three days prior to, three days after, and day of the sampled trip's launch. In 1975, densities for sampled trips varied from a low of 6 trips (80 people) per week to a high of 36 trips (897 people) per week.

Figure 2.1 Number of Launches Per Week from Lees Ferry, 1998

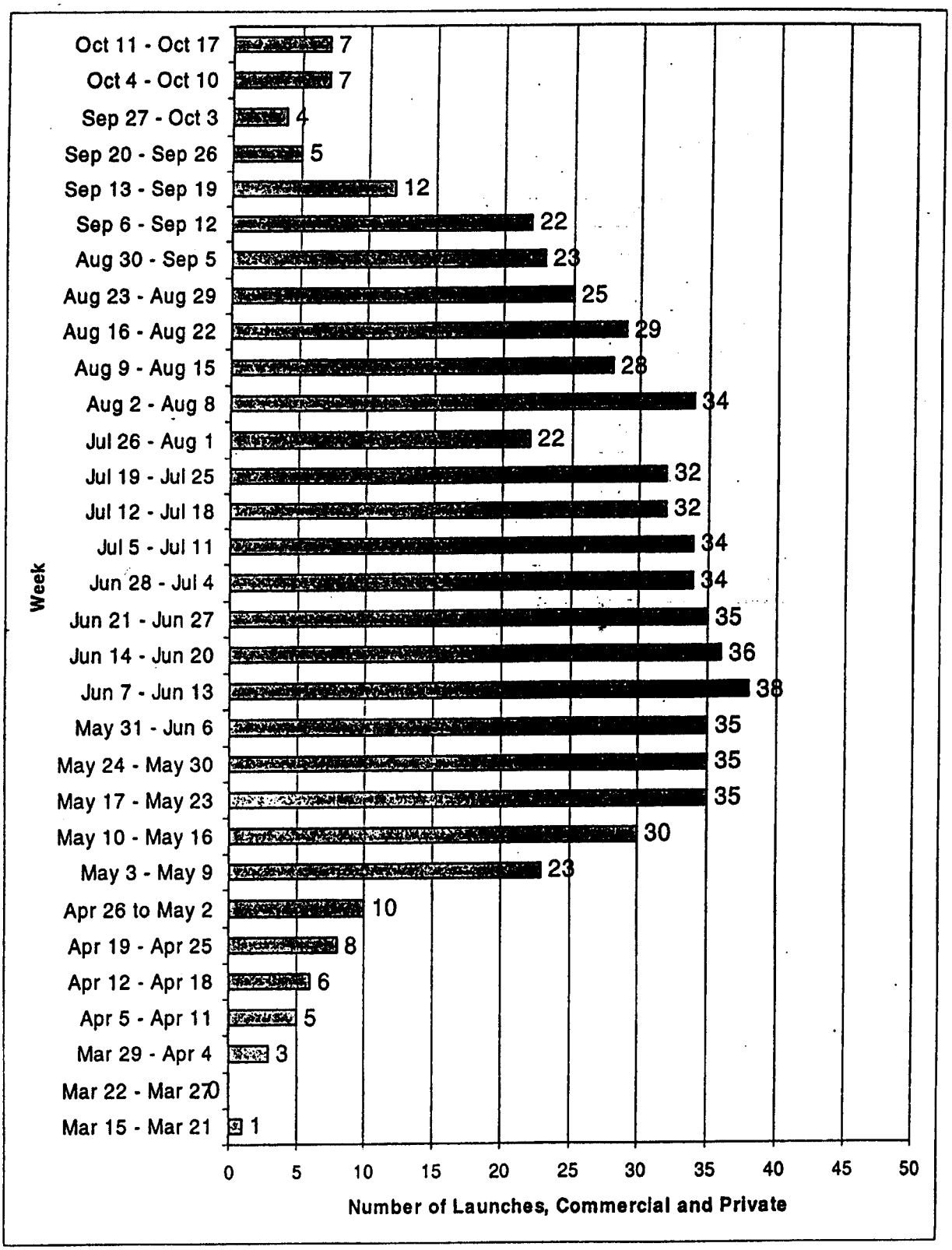


Table 2.5 presents summary information about the 1998 sample of trips. A total of 1,047 surveys were obtained from passengers, with an overall response rate of 86%. Guides were asked to complete a shortened version of the survey. Among guides, response rates were 54.3% on motor trips, 87.3% on oar trips, and 74.0% overall, with 110 completed surveys. Observational data were collected on a total of 502 days.

Table 2.5 Number of Trips, Surveys, and Days of Encounter Data for Trips Sampled in 1998

	Commercial		
	Motor	Oar	Private
Number of trips	22	17	9
Number of surveys	472	451	124
Response rate (percent)	87.0	83.2	91.0
Days of encounter data	157	214	131

Observer Data

Observer Roles

Observers generally met their trip at Lees Ferry on the day of the launch or the day before to help with rigging. When requested by the outfitter, the observer also attended pre-trip orientations with commercial passengers. On private trips, observers attended the NPS briefing along with trip members.

During the commercial trips, observers participated in camp chores (e.g., filtering water, loading or unloading boats, setting up the toilet, or cooking), as long as the guides were comfortable with this role. On private trips, they participated fully in all activities. When trips stopped at attraction sites, the observer did whatever the majority of the group decided to do.

Any study employing participant observation has the potential for observers to influence respondents; on sampled trips observers would naturally get to know and interact with passengers. By the end of the study period each had made several trips down the river and was therefore more knowledgeable than most passengers. To avoid problems of biasing results, observers were instructed to discuss their project with the group during an early briefing (usually on the first day). This entailed describing the project in general terms as a research effort to help the NPS manage the river and give the public an opportunity to influence management outcomes. The group was told that passengers would have an opportunity to fill out a questionnaire at the end of the trip, but the specific topics were intentionally not mentioned. Observers were told that they were not to offer personal opinions about three issues: (a) the relative merits or appropriateness of motor boats and/or oar boats on the river; (b) the relative merits or appropriateness of commercial and/or private trips on the river, or the merits of the current allocation; and (c) whether the canyon does or should provide a "wilderness" experience.

Observers were instructed to collect data on encounters unobtrusively, because we did not want to cue passengers to pay more attention to other trips than they would have if observers were not present. Observers let people know that they were collecting data on the trip schedule (i.e., when and where trips stopped, when they passed features, and what activities they did), which provided a rationale for their frequent note-taking. When passengers asked about the nature of the study, observers provided general information (e.g., that the study was designed to help plan for recreation on the river) and told people that they would be willing to provide more detailed information after the completion of questionnaires. Most people understood that that we didn't want to reveal too much of the focus in order to avoid bias in how respondents experienced the trip or the views they might have.

On trips with more than one boat, observers were instructed to change boats every day. Generally this was acceptable to guides. However, on some commercial trips observers were required to ride on baggage boats.

Data About Trips and Encounters

Observers collected information about trip schedules and encounters on several forms, which are described below. Because NPS standards and 1975 data addressed encounters on the river, at attraction sites, and at campsites separately, data were collected according to these categories.

Trip Schedule

The trip schedule (Figure 2.2) was a detailed itinerary of the trip down the river. Observers made note of every stop that lasted more than 15 minutes. Nearly all stops were for attractions (such as hikes, water play, or archaeological sites), lunch, or camp. Particularly on oar trips, stops to scout major rapids were also common.

Figure 2.2 Trip Schedule

TRIP SCHEDULE
Outfitter: _____ Propulsion:_____ Trip: _____

Location Name	Mile	Arrive Time	Day	Leave Time	Day	Stop for

Daily River Contacts

Every contact with another group was recorded in a separate column on the "Daily River Contacts" form (Figure 2.3). Observers paid close attention to other trips, and included all trips that they saw ahead, behind, or on the shore. Observers made their best determination of whether boats belonged to the same party. Boats together in one trip sometimes travel apart, so observers had to decide when boats were from one big party and therefore one contact, or when they were separate parties. If more than 5 minutes separated the boats, they were generally considered separate contacts.

For each encounter, observers wrote down the abbreviation of the outfitter name (if it was a commercial trip) or "Priv." for a private trip. The also recorded whether the trip observed was on the shore or on the water. The number of minutes during which they were in sight of the

party contacted was recorded under "time in sight." This differed from the duration of the contact itself, which was defined as the number of minutes during which they were *in close proximity* to the other party. Observers began timing the contact when they were within 20-30 yards (talking distance) of the other trip, and stopped when they got more than 20-30 yards away. There were many instances, especially when passing trips that were on shore, when trips were never in close proximity. For these cases the duration of contact was recorded as zero.

Figure 2.3 Data Collection Form for Daily River Contacts

DAILY RIVER CONTACTS
Day _____ of _____ Trip: _____

			1	2	3	4	5	6	7	8	9
		group name									
		(1) shore (2) water									
		time in sight (min.)									
		duration of contact (min)									
trip type		(1) oar (2) motor (3) hikers									
		(1) private (2) commercial									
size of contact		total # people									
		total # boats									
		people per boat									
seen	before	(1) no (2) yes, on river today (3) yes, attr site today (4) yes, river previous day (5) yes attr site previous day									

Two pieces of information were recorded about the type of trip encountered: whether it was a motor, oar, or hiking trip, and whether it was a commercial or private trip. Observers counted, as accurately as possible, the number of people (passengers plus crew) they saw in each encounter. They also counted the number of boats. If empty boats were tied at shore (with

group members hiking away from the river), they were still counted. All boats, from large rafts to individual kayaks, were considered "boats," without distinguishing among them. This convention, which worked well in 1975, later proved to complicate analysis on 1998 data, because a small trip might have more boats, if those boats were kayaks, whereas a large trip (in terms of people) might have only one or two boats. Because of this issue, the data pertaining to numbers of groups and numbers of people were ultimately more informative.

A specific issue arose when observers saw the same trip more than once. If another trip was traveling about the same speed, they might be in and out of sight several times, perhaps over an extended period of time. When this happened within a 5-minute period, it was counted as one contact, and just the time when the other trip was actually in sight was recorded.

However, if the observer's trip passed another trip, got out of sight for more than 5 minutes, then slowed or stopped and was passed by the other group, this counted as two separate contacts. This sort of "leap-frogging" sometimes occurred numerous times when the trips were on similar schedules. For about the first half of the study period, observers merely wrote in the group name for each encounter, without specifically mentioning whether they had seen the group before. When it became obvious that this was a frequent occurrence, a separate line was added to the data form for observers to indicate whether (and where) they had seen the group before. From the early season data, when "seen before" information was not collected, it was usually possible to discern from the group names and times of contact which groups were seen more than once. However, the later season data permit more accurate evaluation of this occurrence. Such data were not collected in 1975.

Attraction Site Stops

Each time the sample trip stopped along the river, the observer filled out one column on the "Attraction Site Encounters" form, whether they saw anyone there or not (Figure 2.4). Lunch stops were not included on this form unless they were at an attraction site. (Lunch was always recorded on the trip schedule, however.) Attraction sites were generally side canyons, water falls, or archaeological sites. A stop meant that the boats were landed and people got out. Unless guides made an effort to include all the passengers in looking at a rapid, it was not generally considered an attraction site. However, if guides made the rapid a group project, and if stops were more than 15 minutes, rapids were considered attraction sites. This rarely occurred on motor trips, but was not uncommon at Granite, Hermit, Crystal, and Lava Falls for commercial oar trips and private boaters.

Figure 2.4 Data Collection Form for Attraction Site Encounters

ATTRACTION SITE STOPS

Trip: _____

			1		2		3		4	
		site name								
		day of trip								
		time stopped								
		length of stop (hrs)								
		Location (shore/water)	S	W	S	W	S	W	S	W
trip type		(1) oar (2) motor (3) both (4) non-river								
		(1) pvt (2) comm. (3) both								
size of contact		total # groups								
		total # boats								
		total # people								

At each attraction, the observer recorded the site name, the day of the trip, the time they stopped, and the length of the stop. Sometimes trips camped at attraction sites, taking hikes either in the afternoon or early the next morning. In these cases the "length" of the attraction site visit recorded was the time spent actually visiting the attraction, rather than the entire night. Thus, attraction site encounters referred to those focused on at the destination itself.

The rest of data collected for each attraction stop pertained to encounters with other trips. If no one was seen, observers wrote "no contact" and left the rest of the column blank. If they saw anyone (other river trips or hikers/mule parties not associated with river trips), they recorded the type(s) of craft (oar, motor, both, or non-river), the type(s) of trip (private, commercial, or both, as well as NPS or science trips), and the total number of groups, boats, and people present. (In 1975, no separate distinction was made for NPS trips or science trips, and it is not known whether these encounters were counted at all. Such contacts were more rare at that time than they are today.) Sometimes there were several trips stopped at the site, and information was reported for all trips together. (In retrospect, it would have been useful to document information separately for each trip.) Sometimes it was difficult to know for certain how many people were present, especially if some were hiking and some were at the boats. In these cases, observers made their best effort to count all the individuals they observed during their visit. All trips that arrived and/or left while the observer's trip was stopped were counted.

For each attraction site stop, observers recorded encounters on shore (i.e., boats and groups they saw that were on shore) under the column marked "s" (for shore), and encounters with boats that floated past without stopping under the column marked "w" (for water). They only attended to "water" encounters when they were in sight of the river. During the time that they were away from the river at an attraction site (hiking, for example), they often couldn't see

any boats on the water, so none would have been counted. This distinction was made because in 1975 only "shore" encounters were counted at attraction sites, and we wanted comparable data. However, it was also of some interest to know how many trips passed by while the target trip was stopped.

Campsite Contacts

One or more columns on the "Campsite Contacts" form was filled out each time observers camped (Figure 2.5). A contact was defined as any group that camped within sight or hearing of the target trip. If the trip had no contacts, observers wrote "no contacts" in the column. This item referred to other groups who camped nearby, not those who stopped only for a short break. This meant that if, for example, the study group camped at an attraction site and the next morning another party stopped there, the contact was considered an attraction site contact, not a campsite contact. If there was more than one other party camped within sight or sound, a separate column was filled out for each group. Observers also kept track of the number of other trips and boats that passed by while their trip was camped.

Figure 2.5 Data Collection Form for Campsite Contacts

CAMPSITE CONTACTS

Trip: _____ Day of Trip: _____

		1	2	3	4	5	6	7	8	9
	site name									
proximity	(1) see or hear (2) see and hear (3) right next to each other									
trip type	(1) oar (2) motor (3) both (4) non-river									
trip type	(1) private (2) commercial									
Trip size	total # boats									
Trip size	total # people									
	Number of groups Passing by									
	Number of boats passing by									

Summary Sheet

Observers completed a "Summary Sheet" for each trip (Figure 2.6). This recorded information about trip characteristics (e.g., numbers of passengers). If the number in the party changed during the trip, observers made notes about the number of passengers making exchanges and where the exchanges occurred. They also recorded how many of the passengers and guides were eligible to complete the survey. (Children under 15 were not eligible, and by the end of the season, some guides had previously completed the survey, and therefore were not eligible.)

Information included the observer's name, launch date, and outfitter name. The length of the trip and type of craft were also recorded. Any other comments or unique aspects of the trip were described. Observers also recorded whether the trip had an orientation session, and how many instructions (e.g., about safety, hygiene, or other behaviors) were given by the guides.

Figure 2.6 Data Collection Form for Trip Summary Information

SUMMARY SHEET

Observer: _____

Trip leaving date: _____

Outfitter: _____

Length of trip _____ days (first and last included)

Trip type (motor, oar): _____

Trip Size:

People in party (include boatmen): _____

Number of boats: _____

People per boat: _____

Number of questionnaires: _____ of _____ possible

Debarkation point: _____

Additional comments or unique aspects of this trip:

Orientation session? (yes, no):

Degree of information about how to behave on trip:

_____ # of instructions

Time spent instructing: _____

Questionnaire Data

Topics of the Survey

Questionnaire topics and questions were developed in several ways. Several issues were evident from conversations with the Park Service, commercial outfitters, and private boaters. Many of these dealt with experience quality and crowding. Crowding was a central topic of the survey, largely because this issue had driven the use quotas established after the 1975 study, and information was needed on the number of encounters, how they compared to current

management standards, and how visitors felt about them. Several items were developed to assess boaters' opinions about the desirability of different management actions that might be taken to reduce crowding.

One issue currently facing the Park Service is the wilderness status of the Colorado River through Grand Canyon. The formal designation of the river has not been decided, and the NPS desired information from the public about whether the river provides wilderness-like experiences. Therefore, several questions were adapted from other research to help understand what boaters think wilderness is and whether they think the river does or should provide wilderness experiences.

Other issues arose during formal meetings with the commercial outfitters and the Grand Canyon Private Boaters' Association. The outfitters were particularly interested in the sources of information people use to select their commercial trips, their motivations, the characteristics that are important in trip choice, the factors that influence trip quality, and the impact of trips on boaters' attitudes. Questions were developed to address these topics.

The private boaters were primarily concerned with issues of allocation. Because we felt that many commercial passengers would be understandably unfamiliar with such issues, and because the positions of different interest groups on this issue seemed already to be relatively clear, we chose not to include many questions pertaining to this issue. Some private boaters were interested in developing questions about the effect of motors on boaters' experiences. We had several questions of this type from the 1975 survey, and these were replicated on the 1998 survey.

The majority of the questions were taken directly from the 1975 study by Shelby and Nielsen. The need to replicate questions precisely, in order to compare results across time,

limited our ability to alter some questions. For example, several of the 1975 questions used 4-point Likert-type items (with response scales of "strongly disagree, probably disagree, probably agree, and strongly agree"). Today, most researchers recommend 5- or 7-point response scales, with a middle, or neutral, alternative. However, changing the response categories would have prevented us from being able to compare results across time, so we opted to use the original framework.

Separate forms of the survey were developed for boaters and commercial guides. The guides' form included many items from the boaters' survey, but eliminated questions that seemed irrelevant to guides, such as questions about trip planning, trip selection, and various experiences. Private boaters and commercial passengers received the same forms, although there were some questions (generally about interaction with or evaluation of guides) that did not apply to private boaters.

Administration of the Survey

Ideally, questionnaires were distributed the last night on the river. However, the second to last night was often better because of parties or social events planned for the last night. Observers worked out the details with trip leaders in advance, and passengers were informed on the first day of the trip that there would be the opportunity to complete a questionnaire.

Questionnaires were generally passed out when people still had an hour or more of daylight. Often this occurred after boats were unloaded at camp, during the social time before dinner. Observers were careful to explain that participation was voluntary and anonymous, but also stressed that it was important to hear from everyone and that this was the only opportunity for representative input from the public into river planning efforts. Observers handed out a

survey, pencil, and envelope to all passengers over the age of 15, and asked them to place the completed surveys in an ammo can or with the observer's gear when they were done. Because questionnaires were completed anonymously, there was no way to follow-up with non-respondents. Some passengers who didn't want to participate simply returned the blank survey in their envelope. Despite the inability to follow up with non-respondents and the length of the questionnaire (many respondents took more than 30 minutes to complete it), response rates were generally high.

When exchanges occurred, observers distributed the survey to those leaving the trip on the last night before they left the trip. (This differed from the 1975 protocol. Exchanges occurred much less frequently in 1975, and at that time passengers exchanging out of trips did not complete questionnaires.) Departing passengers were asked not to discuss the survey with others who were continuing, in order not to bias their responses or experiences. All respondents were asked to complete the questionnaire individually, without discussing their answers with others.

The envelopes received from passengers and guides were labeled with the observer's name, the trip launch date, and the trip name, so that data could later be analyzed by trip type.

Chapter 3: Observational Data

This chapter describes observational data collected during 47 sampled trips. Following information about the trips, information about daily encounters on the river is presented in two sections. The first presents information about individual encounters (their type and duration) and the second summarizes information about the total number and type of encounters per day. These are followed by a section describing encounters at attraction sites, and a final section describes encounters at campsites.

Trip Characteristics

Group sizes ranged from a few small trips with less than 10 passengers (from Whitmore Wash to Lake Mead) to a few trips with more than 35 passengers. On some trips, group size changed following exchanges of passengers at Phantom Ranch or Whitmore Wash. Most of the commercial oar trips accompanied by observers had between 16 and 25 passengers departing from Lees Ferry (Table 3.1). Motor trips varied more in size, primarily because some had one boat while others had two (Table 3.2). Most private trips sampled were between 10 and 15 people, while two had the maximum allowable 16. The number of commercial guides and other staff varied, from single individuals on occasional one-boat motor trips to eight on some larger oar trips.

Whereas motorized trips were almost always one- or two-boat trips, commercial oar trips and private trips varied more in the number of boats. These trips typically had five or six craft.

Table 3.1 Group Size at Lees Ferry in Sampled Trips

Number of Passengers	Motor	Oar	Private
	-----Number of Trips-----		
≤15	7	1	6
16-20	3	7	2
21-25	1	7	
26-30	7	2	
31-35	2		
>35	2		
Total Number of Trips	22	17	8

Table 3.2 Number of Boats in Sampled Trips

Number of Boats	Motor	Oar	Private
	-----Number of Trips-----		
1	10		
2	11		
3	1		
4		1	1
5		8	
6		7	4
7		1	1
8			
9			1
≥10			1

On-River Encounters

Duration and Characteristics of Encounters

Observers recorded each time they saw another party – from the time the group came into sight until it passed out of sight – as an encounter. These numbers ("river encounters") refer

only to encounters that took place while the observer's trip was on the water. More than 1,900 such encounters occurred during the approximately 500 days of observation. Encounters that took place when the observer's trip was stopped at an attraction site or a camp were recorded separately (see sections on Attraction Site Encounters and Camp Encounters below). Encounters included sightings of river trips that were also on the water and those that were passed while on shore. Hiking groups seen were also documented as encounters, but as a separate category.

On average, encounters (all types together) lasted about 8.6 minutes (Table 3.3). Time in contact (i.e., within earshot, about 20-30 yards) was much shorter, an average of about two minutes. Encounters that lasted less than 30 seconds were recorded as zero for time in sight; this accounts for the minimum value for "time in sight" in Table 3.3. Many of the groups seen (49%) never came within earshot of the observer's trip, and thus the time in contact was recorded as zero. If observers saw boats tied on shore, they were recorded as an encounter, even if no people were present (this sometimes occurred when passengers from the encountered trip were hiking away from the river). In these cases, the number of people was recorded as zero. Similarly, if people were seen walking on shore, but no boats were present (either they were away from their river trip or, more often, were hikers), the number of boats was recorded as zero.

The duration of encounters was highly variable. Although very few groups (0.4%) were in sight less than 30 seconds, 25% of encounters were 8 minutes or longer, with about 7% lasting 20 minutes or more. (Information in Table 3.3 on the 25th and 75th percentiles describes the values below which 25% and 75% of all observations fall.) Longer encounters usually happened unintentionally (as when trips would "leap frog" down the river).

In contrast to the variability in time in sight, time within earshot was almost always low: three-quarters of all contacts lasted a minute or less. Nevertheless, as can be seen from the mean

value and large standard deviation in Table 3.3, some contact times were quite long. This sometimes was deliberate, usually when guides or trip leaders encountered friends and altered their pace to match that of the other group.

Table 3.3 Descriptive Statistics for Duration of On-River Encounters, Number of People, and Number of Watercraft

	Time in Sight (Min.)	Time in Contact (Min.)	Number of People	Number of Boats
Number of separate encounters	1936	1884	1830	1876
Minimum	0	0	0	0
Maximum	145	119	54	24
Mean	8.6	1.9	16.2	3.4
Std. Dev.	12.63	6.58	9.92	2.77
25th Percentile	3.0	0.0	8.0	1.0
Median	5.0	0.1	15.0	2.0
75th Percentile	8.0	1.0	23.0	5.0

The average number of people seen during an encounter was about 16. On six occasions observers documented encounters with more than 40 people (passengers plus crew). Given NPS regulations on group size (36 passengers) this should rarely occur; some of these instances appeared to be cases in which a company had two trips at the same place on the river, and the observer could not distinguish between the two trips. Others were large commercial oar trips with several crew members. For 98% of encounters, observers recorded seeing fewer than 36 people, and the median group size observed was 15.

Although the maximum number of boats recorded per encounter was 24, such a large number was quite rare. In fact, 99% of encounters were encounters with trips of 11 boats or fewer, and 75% were with trips of five or fewer boats. The larger numbers of craft were on kayak support trips.

Some aspects of encounters varied depending on the type of group encountered. For example, average time in sight was longer for encounters with oar trips than for encounters with motorized trips (Table 3.4). Motor trips encountered tended to have slightly more people on average than oar trips encountered. Encounters with private and commercial trips tended to be similar in average amount of time in sight and time in contact (Table 3.5). Encounters with science trips tended to be somewhat longer, and encounters with NPS trips (often rangers) had the longest time in contact. Private trips encountered had fewer people than commercial trips, but had slightly more boats.

Table 3.4 Mean[1] Values for Duration, Number of People, and Number of Watercraft for On-River Encounters, by Type of Craft Encountered

Craft Encountered	Time in Sight (Min.)	Time in Contact (Min.)	Number of People	Number of Boats
Oar (n=946)	10.5	2.4	14.7	5.3
	(15.2)	(7.8)	(8.3)	(2.7)
Motor (n=838)	6.9	1.4	19.9	1.6
	(9.5)	(5.3)	(10.5)	(0.9)

[1]Standard deviation in parentheses.

Table 3.5 Mean Values for Duration, Number of People, and Number of Watercraft for On-River Encounters, by Type of Trip Encountered

Trip Encountered	Time in Sight (Min.)	Time in Contact (Min.)	Number of People	Number of Boats
Private (n=711)	8.2	2.0	9.7	4.3
Commercial (n=1105)	8.8	1.7	21.3	3.0
Science (n=56)	10.7	2.4	7.5	2.0
NPS (n=41)	9.4	4.4	7.9	2.3
Hiker (n=137)	5.7	1.2	5.1	0.1

Differences between Encounters with Groups Passed on Shore Versus Groups Seen on the Water

Trips that were on the water when seen tended to be in sight slightly longer than trips that were seen on shore (Table 3.6). These differences are surprisingly small; we had expected encounters on the water, when both trips are traveling the same direction, to last substantially longer than encounters with trips that were stationary on the shore. As expected, shore and water encounters tended to have similar numbers of people and boats.

Table 3.6 Mean Values for Duration, Number of People, and Number of Watercraft for On-River Encounters: Trips on Shore Versus Trips on Water

Location of Group Seen	Time in Sight (Min.)	Time in Contact (Min.)	Number of People	Number of Boats
Shore	7.3	1.7	14.1	3.7
Water	9.9	2.1	18.4	3.2

Table 3.6 presents all encounters (different craft) together by location, but interesting differences emerge when oar and motor trips are examined separately (Table 3.7). Encounters

with oar trips on the water were on average nearly twice as long as encounters with oar trips that were on shore. Encounters with motorized trips showed much less variability in duration between trips seen on shore versus on the water, with on-water encounters actually being slightly shorter than shore encounters. This difference probably reflects the greater ability of motor trips to move quickly past others on the water.

Table 3.7 Mean Time in Sight (Minutes) for Shore and Water Encounters, by Type of Craft Encountered

	Location of Group Encountered	
Type of Craft Encountered	Shore	River
Oar	7.5	14.1
Motor	7.6	6.6

Interestingly, encounters with private trips seen on the water were on average twice as long as those when the private trip was seen on shore by a trip floating past (Table 3.8). This may be a function of type of craft – the differences are very similar to differences between oar and motor trips, and all private trips accompanied in this study were oar trips. However, it may also reflect the nature of private trips – having several craft that are often spread out over a greater distance when on the river. In contrast, encounters with commercial trips (oar and motor together) were about the same length, regardless of whether the trip was seen on the shore or on the water. Encounters with NPS trips, and especially science trips, although rare, were longer than other encounters. This may be because passengers were curious about scientific research

and spent time talking to or observing researchers, or because NPS rangers intentionally contacted groups.

Table 3.8 Mean Time in Sight (Minutes) for Shore and River Encounters, by Type of Trip Encountered

	Location of Group Encountered	
Type of Group Encountered	Shore	River
Private	6.1	12.6
Commercial	8.1	9.2
Science	13.1	8.1
NPS	9.9	8.4

Length of Encounters by Own Trip Type and Type of Trip Encountered

The previous analysis examined the length of encounters by type of trip encountered, but did not make any distinction for the type of trip accompanied. One might be equally interested in encounters from the perspective of each type of trip. For example, how long is a typical encounter between two motor trips verses between two oar trips? This information is presented in Table 3.9.

People on commercial motor trips had relatively short encounters with other trips, regardless of type of trip encountered. However, encounters between two motorized trips were on average especially short, with a median of only three minutes in sight. People on commercial oar trips, on the other hand, had rather long encounters with other commercial oar trips, on average 20 minutes. Interestingly, the length of encounters with private trips by both commercial oar trips and other private trips were about the same length, an average of about 10 minutes.

Table 3.9 Descriptive Statistics for Time in Sight Per Encounter (Minutes) Based on One's Own Trip Type and Type of Trip Encountered

		Own Trip		
		Commercial Motor	Commercial Oar	Private
Trip Encountered	Commercial Motor	$n = 311$ Mean[1] = 5.9 (8.1) Median = 3 Max=60	$n = 255$ Mean = 7.5 (9.7) Median = 5 Max=90	$n = 168$ Mean = 6.7 (5.7) Median = 5 Max = 32
	Commercial Oar	$n = 142$ Mean = 8.0 (8.2) Median = 5 Max=40	$n = 107$ Mean = 20.5 (28.0) Median = 7 Max = 145	$n = 121$ Mean = 12.7 (15.0) Median = 7.0 Max = 100
	Private	$n = 285$ Mean = 6.9 (8.3) Median = 5 Max=60	$n = 212$ Mean = 10.2 (15.6) Median = 5 Max = 137	$n = 74$ Mean = 10.4 (11.2) Median = 6.5 Max = 60

[1]Standard deviation in parentheses.

Multiple Encounters with the Same Groups

Observers kept track of whether they had seen a group on a previous occasion (either earlier on the same day or on the previous day). About 38% of all encounters were with groups that had been previously encountered (Table 3.10). This figure was 44% for oar trips (commercial and private together) and 37.5% for motorized trips. It was lower (33%) for private than commercial (42%) trips, reflecting the generally slower speed of private trips compared to commercial trips. Private trips tended to be passed by faster commercial trips, who were not seen again. On the other hand, many commercial trips traveled at a similar pace to other commercial trips and therefore encountered each other more often. Regardless of trip type, a rather large percentage of all encounters were with groups previously encountered. The effect of multiple versus "unique" encounters is not well understood, and the issue is not raised in the current CRMP. Therefore, the NPS might want to discuss and clarify management standards for

encounters. Currently, the standards do not specify whether one should count all, or only unique, encounters. Given that a large proportion of encounters are with groups seen before, this issue seems worthy of future attention.

Table 3.10 Proportion of Encounters that Were With Groups Seen Before

	Not Seen Before	Seen Before
Type of Trip Seen	-----*Percent*-----	
Oar (Private + Commercial)	55.7	44.3
Motor	62.5	37.5
Private	57.1	32.9
Commercial (Motor + Oar)	58.2	41.8
Science	52.7	47.3
NPS	57.1	42.9

Total Daily River Encounters

Daily Encounters Across All Trip Types

The previous section described aspects of individual river encounters between groups. For each day that observers were on the river, they also computed the total number of daily river encounters (DRC). There were approximately 500 days of such data. In presenting these data, several differentiations are made. First, data are presented separately for "unique" encounters and "all" encounters. Unique encounters include only the first time another group was seen on a given day, whereas "all" encounters include each additional sighting of the same group as another encounter. (Given the number of repeat encounters, these numbers differ substantially.) A group seen on more than one day was counted as "unique" the first time it was seen each day.

Second, data are presented separately for "shore" encounters and "water" encounters, depending on where the encountered group was seen. Finally, separate information is presented for the number of groups, number of people, and number of boats seen each day.

On average, observers saw 1.3 unique groups on the shore and 1.4 unique groups on the water during the day, for a total of 2.7 unique groups (Table 3.11). When multiple encounters with the same group are added in, the total number of all encounters rises to 3.6 groups seen per day, on average. This corresponds to an average of 25 total people seen on the shore and 34 total people seen on the water, or about 60 total people seen per day.

For time in sight of other groups, observers reported an average of about ½ hour per day in sight and only 7 minutes within earshot of other groups. (These numbers do not include encounters at attraction sites, which would increase the overall amount of time substantially.) The variability in both total time in sight and total time within earshot was large, indicating that on some days observers were well above the average and on other days well below the average. The maximum amount of time in sight ever recorded was about 3.5 hours (215 minutes) and the maximum amount of time within earshot was about 2.25 hours (134 minutes). Thus, even on the busiest days, observers did not report being in sight of other groups more than about one-third of the time that they were on the water.

Observers never saw more than four hiking parties from the water in any given day, and the average number seen (0.25) was quite low.

Table 3.11 Descriptive Information about River Encounters Per Day

	Seen On	Type of Encounter	*n*	Max.	Mean	Std. Dev.
Unique Groups[1]	Shore	Groups	502	13	1.3	1.65
	Shore	People	500	198	19.3	27.84
	Shore	Boats	500	63	5.5	7.55
	Water	Groups	502	8	1.4	1.45
	Water	People	481	176	23.6	26.84
	Water	Boats	502	30	4.2	4.82
	Shore + Water	Total Groups	502	17	2.7	2.25
All Encounters[2]	Shore	Groups	502	13	1.7	1.96
	Shore	People	499	229	25.3	33.8
	Shore	Boat	499	63	6.7	8.6
	Water	Groups	502	11	2.0	1.82
	Water	People	484	219	33.6	34.4
	Water	Boats	502	48	6.2	6.74
	Shore + Water	Total Groups	502	18	3.6	2.96
	Shore + Water	Total People	482	305	59.2	52.8
Hiking	Shore	Groups	502	4	0.3	.62
	Shore	People	502	32	1.3	3.98
Total Time (Min.)	Shore + Water	In Sight	501	215	32.6	32.88
	Shore + Water	In Contact	500	134	6.8	13.55

[1]Each trip encountered was counted only one time per day.
[2]Each encounter with the same trip was counted as a separate encounter.

Daily Encounters by Type of Trip Accompanied

There were significant differences in total daily encounters by type of trip accompanied (Table 3.12). Observers on commercial oar trips reported an average of 2.15 unique encounters

per day, versus 2.22 for private trips and 3.87 for commercial motor trips. The commercial oar and private trips were not significantly different, but the commercial motor trip average was significantly higher. Similarly, looking at total encounters incorporating multiple sightings, commercial oar and private trips averaged about three encounters per day when on the river, versus five for commercial motor trips. These findings support conventional wisdom that motor trips, traveling faster farther each day, have more encounters.

The amount of time groups spent in river encounters showed interesting differences by type of group accompanied. Total time in sight did not differ, being about 30 minutes. However, time within earshot did differ: on commercial oar trips all contacts together lasted an average of 8 minutes. Commercial motor trips were next in average time in contact, at 6.6 minutes per day. Private boaters' contact times were shortest, with an average of 4.5 minutes. Thus, although total time in sight of others for each type of trip did not differ significantly, time in contact (within earshot) was greatest for commercial oar trips and significantly less for private trips. This reinforces observations that motor trips pass in and out of sight more quickly than oar trips, so the greater number of encounters they have is offset by the shorter duration of each encounter. The differences between commercial and private trips might also reflect a less pervasive camaraderie between commercial and private trips than among commercial trips in general.

Table 3.12 Differences in Daily River Encounters by Type of Trip Accompanied

			Trip Accompanied			
	Location	Type	C. Oar	C. Motor	Private	p^1
Unique[2]	Shore	Groups	.91[a]	2.3[ab]	.74[a]	.000
	Shore	People	12.6[a]	35.1[b]	11.3[a]	.000
	Shore	Boats	4.4[a]	9.0[b]	3.2[a]	.000
	Water	Groups	1.29	1.52	1.47	.248
	Water	People	21.4	23.8	26.9	.190
	Water	Boats	3.5[a]	4.7[b]	4.7[b]	.024
	Shore + Water	Total Groups	2.15[a]	3.87[b]	2.22[a]	.000
All[3]	Shore	Groups	1.21[a]	2.82[b]	.99[a]	.000
	Shore	People	17.1[a]	43.7[b]	16.8[a]	.000
	Shore	Boats	5.4[a]	10.5[b]	4.3[a]	.000
	Water	Groups	1.78	2.18	1.98	.114
	Water	People	29.2[a]	36.2[ab]	37.7[b]	.046
	Water	Boats	5.63	6.85	6.32	.219
	Shore + Water	Total Groups	2.97[a]	5.10[b]	2.99[a]	.000
	Shore + Water	Total People	46.3[a]	81.2[b]	54.9[a]	.000
Hiking	Shore	Groups	0.21	0.30	0.24	.360
	Shore	People	.84[a]	1.82[b]	1.27[ab]	.066
Total Time (Min.)	Shore + Water	In Sight	33.1	33.8	26.7	.130
	Shore + Water	In Contact	8.43[a]	6.63[ab]	4.45[b]	.029

[1]ANOVA. Numbers with different superscripts within each row are different at α=.05.
[2]Each trip encountered was counted only one time per day.
[3]Each encounter with the same trip was counted as a separate encounter.

Daily Encounters by Month

Table 3.13 Differences in Encounter Rates by Month

	Location	Type	June	July	August	Sept.	Oct.	p^1
Unique[2]	Shore	Groups	1.59 [a]	1.50 [a]	1.32 [a]	1.18 [a]	0.71 [b]	.003
	Shore	People	26.1 [a]	23.7 [ab]	15.8 [bc]	15.6 [bc]	11.0 [c]	.000
	Shore	Boats	6.01	5.97	5.89	5.05	4.05	.347
	Water	Groups	1.74 [a]	1.33 [ab]	1.65 [a]	1.22 [bc]	0.86 [c]	.000
	Water	People	30.7 [a]	24.1 [a]	26.4 [a]	16.4 [b]	15.5 [b]	.000
	Water	Boats	4.50	3.40	4.83	3.45	4.71	.083
	Shore + Water	Total Groups	3.35 [a]	2.80 [ab]	2.95 [ab]	2.38 [b]	1.58 [c]	.000
All[3]	Shore	Groups	1.95 [a]	1.87 [a]	1.66 [a]	1.53 [a]	0.91 [b]	.004
	Shore	People	32.1 [a]	31.0 [ab]	21.6 [bc]	22.3 [abc]	14.9 [c]	.001
	Shore	Boats	7.21	7.24	6.94	6.43	5.19	.478
	Water	Groups	2.20 [ab]	1.94 [ab]	2.35 [a]	1.76 [b]	1.25 [c]	.000
	Water	People	39.2 [a]	36.7 [a]	38.6 [a]	25.4 [b]	22.3 [b]	.001
	Water	Boats	5.49 [a]	5.30 [a]	7.88 [b]	5.47 [a]	6.92 [ab]	.017
	Shore + Water	Total Groups	4.23 [a]	3.79 [a]	4.06 [a]	3.38 [a]	2.18 [b]	.000
Hiking	Shore	Groups	0.28 [a]	0.18 [a]	0.14 [a]	0.21 [a]	0.47 [b]	.003
	Shore	People	1.51 [ab]	1.07 [ab]	0.61 [a]	1.32 [ab]	1.96 [b]	.187
Total Time (Min.)	Shore + Water	In Sight	32.6 [ab]	32.0 [ab]	36.8 [a]	30.4 [ab]	25.1 [b]	.200
	Shore + Water	In Contact	7.83	6.32	7.21	7.53	4.76	.567

[1]ANOVA. Numbers with different superscripts within each row are different at α=.05.
[2]Each trip encountered was counted only one time per day.
[3]Each encounter with the same trip was counted as a separate encounter.

The number of encounters per day while on the river varied significantly depending on the month, although the differences might be considered small in a practical sense (Table 3.13). On the average October day, observers reported 1.6 unique and 2.2 total encounters with other

groups on shore or on the water. The busiest month was June, when observers reported 3.4 unique and 4.2 total encounters per day, on average. There were no differences between July, August, and September. Interestingly, although time in sight and earshot appeared to differ by month, the variation among months was not statistically significant. This may be confounded by different management situations at different times, that is, by the end of the motorized-use season in mid-September. Encounters with oar trips are longer, and these are the only types of encounters in October. Thus, even though there were slightly fewer encounters in October, time in sight was about the same as in other months.

Observers were more likely to see hiking groups in October. The average daily number of encounters with hiking groups rose to almost one group every other day.

Daily Encounters on a Per-Trip Basis

Almost exactly half of the trips had at least one river encounter every day of their trip, but an almost equal number had at least one day with no river encounters at all (Table 3.14). At the same time, most trips had at least one day when they encountered more than five other groups, although, with the exception of commercial motor trips, this was not very common. (Data in Table 3.14 do not include data for the last day of each trip, because trips usually took out well before noon.) It is important to bear in mind that these data refer only to river encounters; encounters at attraction sites were recorded differently. Thus, there may have been days when trips saw no other groups on the river, but had numerous encounters at attractions.

Table 3.14 Distribution of Daily Encounter Levels for Each Trip Accompanied

			Percent of Days With		
Month	Trip Type	Days	No encounters	1-5 encounters	>5 encounters
June	Motor	8	0	88	12
June	Motor	7	0	57	43
June	Motor	8	13	38	50
June	Motor	7	0	57	43
June	Motor	8	0	50	50
June	Motor	7	0	57	43
June	Motor	6	17	83	0
June	Motor	7	0	57	43
July	Motor	7	0	86	14
July	Motor	7	0	29	71
July	Motor	6	17	33	50
July	Motor	7	0	57	43
July	Motor	8	0	75	25
August	Motor	7	14	57	29
August	Motor	7	0	71	29
August	Motor	8	13	50	38
August	Motor	6	0	50	50
August	Motor	7	0	86	14
August	Motor	7	0	86	14
Sept.	Motor	8	13	38	50
Sept.	Motor	7	14	29	57
Sept.	Motor	7	0	43	57
June	Oar	11	18	73	9
June	Oar	15	7	67	27
June	Oar	13	0	85	15
June	Oar	15	0	93	7
July	Oar	13	23	69	8
July	Oar	14	14	71	14
August	Oar	11	0	73	27
August	Oar	14	0	86	14
August	Oar	12	8	83	8
August	Oar	13	8	77	15
August	Oar	12	8	83	8
Sept.	Oar	9	11	89	8
Sept.	Oar	13	23	77	0
Sept.	Oar	13	15	85	0
Sept.	Oar	6	0	83	17
October	Oar	18	0	94	6
October	Oar	12	33	58	8
October	Oar	17	82	12	6

Table 3.14 Continued

			Percent of Days With		
Month	Trip Type	Days	No encounters	1-5 encounters	>5 encounters
June	Private	16	0	94	6
June	Private	17	6	71	24
July	Private	17	35	59	6
July	Private	18	11	44	44
August	Private	15	0	60	40
Sept.	Private	15	20	67	13
October	Private	16	38	56	6

Attraction Site Encounters

Observers kept track of encounters at attraction sites separately from river encounters. They recorded the length of time their group spent at each stop, as well as the total number of trips, boats, and people they saw on the shore at the attraction site and passing by on the river while their own group was stopped. However, they did not collect information on the amount of time in sight of others while at attraction sites.

Although there were certain attractions where the majority of trips stopped (namely Deer Creek, Elves Chasm, Havasu, the Little Colorado River, and Redwall Cavern), there was considerable variability in the sites chosen for hikes, scenery, or educational purposes. Table 3.15 lists only those sites at which more than about 5 trips stopped.

On average, commercial motor trips stopped at 1.8 sites each day, commercial oar trips stopped at 1.3, and private trips stopped at 1.3. Private boaters were more likely to stop at Buckfarm, Matkatamiba, Nankoweap, Phantom, Silver Grotto, Tapeats Creek, Unkar delta, and the Whitmore petroglyphs, and to scout major rapids for more than 15 minutes. Motor trips were less likely to take the Carbon-Lava Chuar hike, but were more likely to stop at Shinamu Creek, Stone Creek, and Travertine Falls. Commercial oar trips were more likely to stop at Fern Glen,

National Canyon, Nautiloid Canyon, and North Canyon, but were less likely to stop at the Little Colorado River, Havasu, or Pumpkin Springs.

Table 3.15 Percent of Trips Stopping at Attraction Sites[1]

Location	Motor	Oar	Private
Blacktail	45.5	52.9	50.0
Buckfarm	4.5	11.8	25.0
Carbon-Lava Chuar	4.5	29.4	25.0
Clear Creek	22.7	23.5	25.0
Crystal Rapid	9.1	29.4	37.5
Deer Creek	90.9	70.6	100.0
Elves Chasm	81.8	70.6	87.5
Fern Glen	9.1	23.5	0.0
Granite Rapid	4.5	17.6	37.5
Hance Rapid	0.0	11.8	25.0
Havasu Creek	81.8	64.7	87.5
Hermit Rapid	0.0	29.4	25.0
Lava Falls Rapid	31.8	41.2	62.5
Little Colorado River	90.9	58.8	87.5
Matkatamiba	31.8	47.1	100.0
Nankoweap	31.8	29.4	62.5
National Canyon	13.6	23.5	12.5
Nautiloid Canyon	9.1	17.6	0.0
North Canyon	27.3	52.9	37.5
Phantom Ranch	59.1	47.1	75.0
Pumpkin Springs	36.4	0.0	50.0
Redwall Cavern	90.9	70.6	100.0
Saddle Canyon	40.9	47.1	50.0
Shinamu Creek	63.6	52.9	37.5
Silver Grotto	0.0	17.6	50.0
South Canyon	27.3	23.5	37.5
Stone Creek	59.1	41.2	37.5
Tapeats Creek	4.5	29.4	50.0
Travertine Falls	27.3	5.9	0.0
Travertine Canyon	18.2	17.6	0.0
Unkar Delta	18.2	11.8	50.0
Whitmore Wash	18.2	17.6	50.0
Average # stops/day[2] (Std. Dev.)	1.77 (1.09)	1.29 (0.78)	1.31 (0.97)

[1]Only sites where 5 or more trips stopped are included.
[2]All stops are included.

Table 3.16 Average Length of Stay at Primary Attraction Sites, All Trip Types

Location	*n*	Mean Time (hrs.)	Std. Dev.
Blacktail	24	1.1	0.67
Buckfarm	5	2.0	0.35
Carbon-Lava Chuar	9	3.0	0.84
Clear Creek	11	1.8	0.66
Crystal Rapid	10	0.5	0.27
Deer Creek	44	3.1	1.61
Elves Chasm	39	1.5	1.13
Fern Glen	7	1.3	0.43
Granite Rapid	7	0.6	0.49
Hance Rapid	4	0.3	0.24
Havasu Creek	37	3.5	1.78
Hermit Rapid	7	0.5	0.19
Lava Falls Rapid	19	0.7	0.40
Little Colorado River	39	1.7	0.99
Matkatamiba	23	1.8	0.85
Nankoweap	18	2.4	1.18
National Canyon	8	2.7	1.24
Nautiloid Canyon	6	1.0	0.62
North Canyon	19	2.2	1.39
Phantom	28	1.7	1.27
Pumpkin Springs	12	0.6	0.36
Redwall Cavern	41	0.9	0.59
Saddle Canyon	23	2.6	0.88
Shinamu Creek	27	1.3	0.93
Silver Grotto	8	2.1	1.79
South Canyon	14	1.0	0.34
Stone Creek	25	1.8	1.58
Tapeats Creek	10	5.0	2.10
Travertine Falls	7	1.3	0.47
Travertine Canyon	7	1.2	0.47
Unkar Delta	10	0.7	0.28
Whitmore Wash	12	1.1	1.05
All sites	661	1.8	1.50

Across all attraction sites and all types of trips, the length of stops was generally between ½ and one hour (Table 3.16). The longest stops included hikes, for example Carbon-Lava Chuar, Tapeats, Deer Creek, and Havasu. Some of the longer stops were also sites where trips both camped and hiked. For example, 78% of trips that stopped at National Canyon also camped

there. The same was true for 37% of those visiting North Canyon, 35% of those visiting Saddle Canyon, 30% of those visiting Nankoweap, and 24% of those visiting Stone Creek.

Table 3.17 Average Length of Stay (Hours) at Attraction Sites, by Trip Type

Location	Motor	Oar	Private
Blacktail	0.8	1.5	0.8
Buckfarm	2.5	2.0	1.7
Carbon-Lava Chuar	4.0	3.1	2.3
Clear Creek	1.6	1.7	2.9
Crystal Rapid	0.6	0.5	0.5
Deer Creek	2.6	3.9	3.7
Elves Chasm	1.1	1.5	2.5
Fern Glen	1.0	1.3	na
Granite Rapid	1.0	0.3	0.8
Hance Rapid	na	0.4	0.3
Havasu Creek	3.4	4.5	1.9
Hermit Rapid	na	0.4	0.6
Lava Falls Rapid	0.5	0.9	0.7
Little Colorado River	1.7	1.6	1.7
Matkatamiba	1.6	1.9	1.8
Nankoweap	1.9	2.6	2.9
National Canyon	1.9	3.6	1.3
Nautiloid Canyon	0.8	0.8	na
North Canyon	1.6	2.9	1.0
Phantom	1.3	2.3	1.8
Pumpkin Springs	0.5	na	0.7
Redwall Cavern	0.6	1.3	0.9
Saddle Canyon	2.2	2.8	2.7
Shinamu Creek	1.1	1.2	1.9
Silver Grotto	na	3.3	1.2
South Canyon	0.8	1.1	1.3
Stone Creek	0.9	3.5	1.6
Tapeats Creek	0.8	5.6	5.4
Travertine Falls	1.2	2.0	na
Travertine Canyon	1.1	1.4	na
Unkar Delta	0.6	0.8	0.9
Whitmore Wash	1.1	0.6	1.6

There were some differences in length of stops by type of trip, although in most cases all were similar (Table 3.17). Where differences existed, commercial oar trips tended to have the longest stops, for example at Blacktail, Havasu Creek, National Canyon, North Canyon, Silver Grotto, and Stone Creek. Commercial oar and private trips both made longer stops than motor trips at Deer Creek, Tapeats Creek, and Nankoweap.

At most attraction sites, most groups did not see other parties (Table 3.18). For example, more than 75% of those stopping at Blacktail, Buckfarm, Crystal, South Canyon, or the Whitmore petroglyphs encountered no one while there. On the other hand, groups stopping at the most popular sites were almost certain of running into other groups. More than 90% of stops at Deer Creek, Havasu, Phantom Ranch, or Tapeats Creek involved encounters with other groups, and more than 70% of stops at Lava Falls and the Little Colorado River involved encounters. At only a few sites (Deer Creek, Havasu Creek, the Little Colorado River, Phantom Ranch, and Tapeats Creek) did groups ever have to share the site with more than five other groups.

Table 3.18 Number of Groups Encountered on Shore at Attraction Stops

		Number of Groups Present on Shore			
Site	*n*	0	1-2	3-5	>5
		------- *Percent of Observations* -------			
Blacktail	25	80.0	20.0		
Clear Creek	10	70.0	30.0		
Crystal	10	80.0	20.0		
Deer Creek	47	6.4	38.3	46.8	8.4
Elves Chasm	39	43.6	53.9	2.6	
Havasu	39	2.6	41.0	48.7	7.7
Lava Falls	19	21.1	68.5	10.6	
Little Colorado River	41	26.8	48.8	21.9	2.4
Matkatamiba	23	60.9	39.1		
Nankoweap	19	31.6	68.5		
National	9	66.7	33.3		
North Canyon	19	31.6	63.2	5.3	
Phantom	31	3.2	35.5	45.2	16.2
Pumpkin Springs	12	66.7	33.3		
Redwall Cavern	42	47.6	42.9	9.5	
Saddle Canyon	23	30.4	56.5	13.0	
Shinamu Creek	27	59.3	40.7		
South Canyon	14	78.6	21.4		
Stone Creek	25	40.0	48.0	12.0	
Tapeats Creek	12	8.3	58.3	25.0	8.3
Unkar	10	80.0	20.0		
Whitmore	12	75.0	0.0	25.0	

Table 3.19 presents the proportion of stops that involved encounters with different numbers of people, and Table 3.20 presents similar information for the number of boats

associated with attraction site encounters. At the busiest sites, Deer Creek and Havasu, about 60% of the time boaters had to share the site with more than 30 other people.

Table 3.19 Number of People Encountered on Shore at Attraction Stops

		Number of People Present on Shore				
Site	*n*	0	1-15	16-30	31-45	>45
		------- *Percent of Observations* -------				
Blacktail	25	80.0	8.0	4.0	8.0	
Clear Creek	11	63.6	9.1	18.2	0.0	9.1
Crystal	10	90.0	0.0	10.0		
Deer Creek	47	6.4	12.8	21.3	8.5	51.1
Elves Chasm	39	46.2	20.5	25.6	5.1	2.6
Havasu	39	2.6	15.4	23.1	12.8	46.2
Lava Falls	19	21.1	21.1	42.1	5.3	10.5
Little Colorado River	40	27.5	15.0	15.0	12.5	30.0
Matkatamiba	23	65.2	17.4	17.4		
Nankoweap	20	30.0	20.0	30.0	10.0	10.0
North Canyon	19	31.6	5.3	26.3	31.6	5.3
Phantom	31	3.2	25.8	35.5	9.7	25.8
Pumpkin Springs	12	66.7	16.7	16.7		
Redwall Cavern	42	47.6	9.5	19.0	11.9	11.9
Saddle Canyon	23	30.4	17.4	17.4	13.0	21.7
Shinamu Creek	27	74.1	11.1	14.8		
South Canyon	14	78.6	7.1	14.3		
Stone Creek	25	40.0	28.0	4.0	16.0	12.0
Tapeats Creek	12	8.3	33.3	33.3	0.0	25.0
Unkar	10	80.0	0.0	0.0	20.0	0.0
Whitmore	12	75.0	0.0	16.7	8.3	0.0

At some sites, such as Deer Creek and Havasu, tie-ups are a limiting factor. At Deer Creek, 24% of the time there were more than 10 boats present from other groups, while at Havasu there were more than 10 other boats present 38% of the time.

Table 3.20 Number of Boats Encountered on Shore at Attraction Stops

		Number of Boats Present on Shore					
Site	*n*	0	1-2	3-5	6-10	11-20	20
		------- *Percent of Observations* -------					
Blacktail	25	80.0	8.0		8.0	4.0	
Clear Creek	10	80.0	0.0	10.0	10.0		
Crystal	10	80.0	10.0	10.0			
Deer Creek	47	12.8	6.4	12.8	34.0	27.7	6.3
Elves Chasm	39	43.6	15.4	12.9	23.1	2.6	2.6
Havasu	39	5.1	18.0	5.1	33.5	30.9	7.7
Lava Falls	19	21.1	5.3	42.2	21.1	10.6	
Little Colorado River	41	31.7	22.0	17.1	17.0	9.7	2.4
Matkatamiba	23	65.2	8.7	13.0	8.7		
Nankoweap	19	42.1	21.1	5.3	15.8	10.6	5.3
National	9	66.7	22.2	0.0	11.1		
North Canyon	19	31.6	10.5	15.8	42.1		
Phantom	29	10.3	10.3	34.4	34.4	10.3	
Pumpkin Springs	12	66.7	8.3	8.3	16.6		
Redwall Cavern	42	47.6	14.3	11.9	21.4	4.8	
Saddle Canyon	22	31.8	22.7	13.6	18.2	13.6	
Shinamu Creek	27	63.0	18.5	14.8	3.7		
South Canyon	14	85.7	7.1	0.0	7.1		
Stone Creek	25	40.0	24.0	12.0	8.0	16.0	
Tapeats Creek	9	33.3	0.0	22.2	22.2	11.1	11.1
Unkar	10	80.0	0.0	0.0	20.0		
Whitmore	12	75.0	16.7	0.0	8.3		

Table 3.21 Mean Number of Groups, Boats, and People Present at Attraction Sites When Others Were Present[1]

	n	Groups	People	Boats
Deer Creek	44	4.0 (6.57)	49.7 (32.1)	9.6 (7.1)
Elves Chasm	22	1.4 (0.58)	19.5 (14.0)	6.1 (4.7)
Havasu Creek	38	3.0 (1.7)	47.2 (34.0)	9.6 (7.0)
Lava Falls Rapid	15	1.4 (0.91)	25.6 (16.0)	6.1 (4.2)
Little Colorado R.	30	2.1 (.13)	38.1 (27.3)	5.8 (5.4)
Nankoweap	14	1.7 (0.5)	25.6 (17.7)	6.5 (7.5)
North Canyon	13	1.5 (0.9)	29.5 (10.7)	5.5 (2.5)
Phantom Ranch	30	3.9 (3.8)	37.2 (30.1)	6.0 (4.2)
Redwall Cavern	22	1.7 (0.9)	31.9 (18.0)	5.6 (4.0)
Saddle Canyon	16	1.8 (1.1)	33.8 (22.9)	5.9 (4.7)
Stone Creek	15	1.7 (1.1)	27.2 (18.5)	6.5 (5.9)
Shinamu Creek	11	1.1 (0.3)	11.9 (13.0)	2.7 (1.8)
Tapeats Creek	11	2.8 (2.0)	25.8 (19.4)	6.6 (7.2)
All other stops	69	1.3 (0.62)	22.4 (19.0)	4.4 (3.2)

[1]Standard deviations are in parentheses

Whereas Tables 3.18 to 3.20 present frequency information about attraction site encounters, it is also useful to know the average number of groups, people, and boats present during stops when encounters occurred. This information is presented in Table 3.21, and does not include information from stops when no other groups were present. Only sites where at least 10 of the trips that stopped had encounters are included. This information shows that Deer Creek

on average had the most people present (50), followed closely by Havasu (47). There was an average of about 10 boats in addition to those from the observer's trip during the typical stop

Across all attractions, including the less popular ones, groups encountered others on about half of their stops (Table 3.22). On average, when encounters did occur, there was usually one other group present, with about 15-20 people. Because the Park Service accepts different rates of encounters at the most popular sites than at other sites, Table 3.22 presents information separately for the five most frequently used attractions. Encounters were almost certain to occur at the high-use destinations, but occur only about 40-45% of the time at other sites. Furthermore, the number of people present during encounters at high-use destinations tended to be much greater than during encounters at other stops (Table 3.23).

Private trips appeared slightly more likely to have encounters at the five most popular stops. This difference is unrelated to length of stay differences – only at Elves Chasm did private trips stay longer. At Havasu, stops by private trips were actually much shorter than those by commercial trips (see Table 3.17).

Table 3.22 Percent of Trips Encountering Other Groups at Attraction Sites, High-Use Versus Other Sites, by Type of Trip Accompanied

	Motor	Oar	Private
High-Use Sites[1]	76	68	83
All Other Sites	41	44	46
All Sites	54	50	55

[1]Five most popular stops: Deer Creek, Elves Chasm, Havasu, Little Colorado, Redwall

Table 3.23 Mean Number of People Present During Encounters, High-Use Versus. Other Attraction Sites

	Motor	Oar	Private
High-Use Sites[1]	33	23	33
All Other Sites	11	11	11
All Sites	19	14	17

[1]Five most popular stops: Deer Creek, Elves Chasm, Havasu, Little Colorado, Redwall

Camp Encounters

Many different sites were used for camping. The most commonly used and the number of observer-nights spent at each are presented in Table 3.24. This information shows that only a few sites were used by more than 10 of the study trips (i.e., more than about 20% of the trips). The most popular sites were Nankoweap, 220 Mile, National Canyon, and Saddle Canyon.

For sites that had multiple nights of camping, we examined how often other groups were camped in sight or sound of the study trip (Table 3.25). For example, during 10 nights at Bass, only once were others present. On the other hand, during 9 nights at Cremation, there were four nights when one other groups also camped there. On 80% of all nights at these more commonly used camps, study trips camped out of sight and/or sound of any other groups.

Table 3.24 Total Number of Camp-Nights per Site, by Type of Trip

Location	Motor	Oar	Private	All
122 mile	2	5	1	8
202 mile	4	3	0	7
211 mile	1	3	0	4
220 mile	4	6	7	17
Bass	1	4	5	10
Blacktail	3	1	0	4
Buckfarm	2	2	3	7
Carbon	1	4	2	7
Cardenas	1	3	1	5
Cremation	3	3	3	9
Deer Creek	2	2	0	4
Doris	3	1	1	5
Fern Glen	4	2	2	8
Galloway	0	2	3	5
Hot Na Na	0	5	0	5
Kanab Creek	2	2	1	5
Ledges	1	6	2	9
Matkat Hotel	1	1	1	3
Monument	3	4	0	7
Nankoweap	6	9	4	19
National	4	7	2	13
Nautiloid	1	3	2	6
Nevills	1	2	1	4
North Canyon	2	5	4	11
Ponchos Kitchen	0	4	2	6
Saddle Canyon	3	6	3	12
Silver Grotto	2	2	2	6
Stone Creek	0	6	2	8
Tapeats Creek	0	7	0	7
Trinity Creek	2	5	2	9
Tuckup	0	2	5	7
Unkar	0	3	1	4
Upset Hotel	0	4	0	4
Whitmore Wash	1	1	4	6
Whitmore Helipad	3	0	0	3

Table 3.25 Number of Other Groups Camped within Sight or Sound, for the More Popular Campsites

Camp Location	Number of Trips in Sight/Sound				Total
	0	1	2	4	
	-----Number of Camp-Nights-----				
Bass	9	1			10
Blacktail	3	1			4
Buckfarm	7				7
Carbon	7				7
Cardenas	5				5
Cremation	5	4			9
Deer Creek	4				4
Doris	5				5
Fern Glen	8				8
Galloway	5				5
Hot Na Na	5				5
Kanab	5				5
Ledges	7	2			9
Matkat Hotel	4				4
Mile 122	5	3			8
Mile 211	4				4
Mile 202	6	1			7
Mile 220	10	6	1		17
Monument	6	1			7
Nankoweap	11	7	1		19
National	10	2		1	13
Nautiloid	6				6
Nevills	2	2			4
North Canyon	6	5			11
Ponchos Kitchen	4	2			6
Saddle	6	5	1		12
Silver Grotto	5	1			6
Stone Creek	7	1			8
Tapeats	5	2			7
Trinity	7	2			9
Tuckup	6	1			7
Unkar	4				4
Upset Hotel	4				4
Whitmore	6				6
Whitmore Helipad	3				3

Another way to look at these data is to compute the likelihood that a trip would have another group camped in sight or sound on any given night. For commercial motor trips, this occurred on 22% of the nights, for private trips on 21% of the nights, and for commercial oar trips on 17% of the nights (Table 3.26). At the six most commonly used camps (Cremation, Nankoweap, North Canyon, Saddle Canyon, 122 Mile, and 220 Mile), groups camped in sight or sound of others 35% of the time. At all other sites, this occurred 14% of the time. Across all sites and types of trips, groups camped in sight or sound of others 18% of the time.

Depending on trip type, about 17-22% of all camp nights were spent camping next to or within sight or sound of another trip. The number was slightly higher for motor trips, but it appears that motor trips were quite variable, as can be seen in Table 3.27, which presents information for each trip as a whole. For example, about 32% of motor trips never camped in sight or sound of another group on any night of the trip, but 9% of motor trips camped in sight or sound of others on at least half the nights of the trip. In contrast, only 18% of oar trips and no private trips had complete solitude every night, but no respondents in either of these two groups ever spent more than half of their nights in sight or sound of another trip.

Table 3.26 Likelihood of Having Another Trip Camped Within Sight or Sound on Any Given Night, All Camp Locations

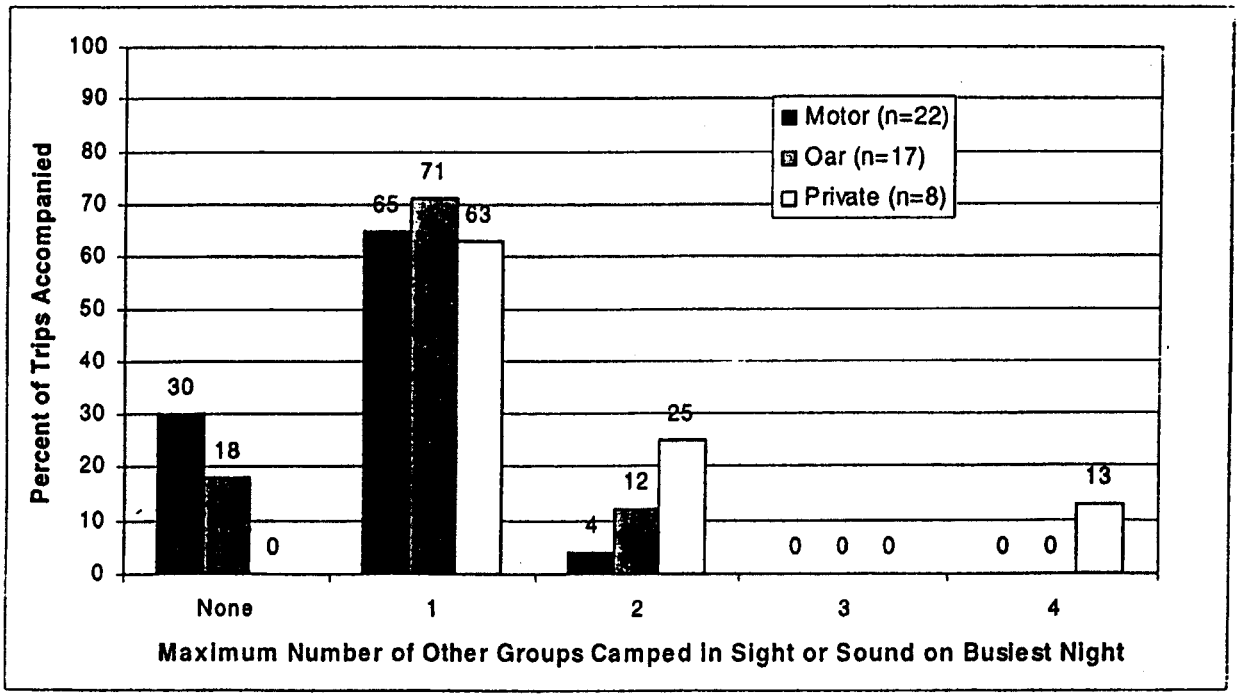
	Motor	Oar	Private
Number of Camp Nights	153	209	126
Percent of Nights When Others Were in Sight or Sound	22	17	21

Table 3.27 Campsite Solitude Across Entire Trip

	Motor (*n*=22)	Oar (*n*=17)	Private (*n*=8)
Did not camp within sight/sound of others on any night	31.8	17.6	0.0
Spent 1-10% of nights in sight/sound of others	0.0	23.5	12.5
Spent 11-20% of nights in sight/sound of others	13.6	17.6	37.5
Spent 21-30% of nights in sight/sound of others	31.8	41.1	37.5
Spent 31-40% of nights in sight/sound of others	13.6	0.0	12.5
Spent 41-50% of nights in sight/sound of others	0.0	0.0	0.0
Spent >50% of nights in sight/sound of others	9.1	0.0	0.0
Average % of nights in sight/sound of others	21.1	15.4	20.7

The most groups ever camped within sight or sound was 4 (which occurred on a private trip at National Canyon). For commercial motor and oar trips, the maximum was two other groups camped in sight or sound (Figure 3.1).

Figure 3.1 Maximum Number of Other Groups Camped Within Sight or Sound on Busiest Night



Chapter 4: Visitor Survey Results

This chapter presents results from the boater survey conducted at the end of 48 trips on the river. An 11-page questionnaire was handed out by the observer on the last (or next to last) night of the trip. Passengers exchanging out of trips at Phantom, Diamond Creek, or Whitmore Wash were given the survey on the last night they spent on the river. Boaters completed the surveys and returned them (anonymously) to the observer. Details of these methods can be found in Chapter 2.

In the following analysis, respondents are grouped as commercial motor passengers ("motor"), commercial oar passengers ("oar"), private boaters ("private"), and guides. Two commercial trips (one dory and one raft) that had motor support are grouped with other oar trips in this presentation.

Results are presented for several categories of questions. First, there is a brief description of the river segments and respondents. This is followed by demographic and past experience variables (visitor characteristics). The next section describes several questions about wilderness issues, including knowledge about wilderness, use of wilderness, and opinions about the wilderness character of experiences provided in the Grand Canyon. The following section describes planning for trips, including important features in selecting trips, preferences for trip type, and waiting times for private boaters. The subsequent section presents questions dealing with experiences during the trip, including overall quality, experiences and benefits received, perception of impacts, awareness of conditions and features and their effect on experience, and comparison to other rivers. This is followed by information about encounters, including

numbers, preferences, evaluations of their effects, personal standards, and willingness to adjust to lower encounter rates. The final section deals with opinions about management actions, specifically group size limits, actions to reduce crowding, and other possible policies.

In presenting data, two types of statistical tests are used to compare groups. For categorical variables, chi-square tests are used. For continuous variables and Likert-type items treated as continuous, two-tailed ANOVAs are used with Scheffe's post hoc comparisons to identify differences between groups. In both cases, a *p*-value of .05 is used as the cut-off for statistical significance.

Trip Characteristics

River Segments

Most of the commercial trips had passenger exchanges at Phantom Ranch and/or Whitmore Wash. Table 4.1 displays the river segments run by respondents. Most private boaters (73%) began at Lees Ferry and took out at Diamond Creek, while most commercial oar passengers took out at Phantom Ranch or Diamond Creek. Motor passengers were most likely to end their trip at Whitmore Wash. Twenty-seven percent of commercial passengers and 85% of private boaters did a "full canyon" trip.

Table 4.1 Number of Respondents by River Segment

	Motor (n=465)	Oar (n=443)	Private (n=124)
	----*Percent*----		
Lees Ferry to Phantom Ranch	10	27	13
Lees Ferry to Whitmore Wash	45	8	0
Lees Ferry to Diamond Creek	3	20	73
Lees Ferry to Lake	18	12	12
Phantom Ranch to Whitmore Wash	1	11	0
Phantom Ranch to Diamond Creek	10	5	2
Phantom Ranch to Lake	0	9	0
Whitmore Wash to Lake	14	6	0
Total	100	100	100

Table 4.2 Number of Nights Spent on the River by Respondents

Number of Nights	Motor (n=464)	Oar (n=442)	Private (n=112)
	-----*Percent*-----		
1	5.6		
2	8.8		
3	9.5	6.1	
4	9.1	13.8	
5	21.1	9.5	4.5
6	23.3	7.2	
7	22.6	22.6	1.8
8		4.8	
9		5.9	
10		1.6	2.7
11		2.9	
12		2.7	
13		14.0	
14		4.1	8.9
15		3.8	8.0
16			8.9
17			36.6
18		0.9	28.6

Trip Length

Trip length ranged from one night to 18 nights on the river (Table 4.2). Predictably, motor passengers spent the fewest nights, commercial oar passengers tended to be intermediate, and private boaters spent the most nights on the river.

Visitor Characteristics

Demographic Information

Forty-two percent of all respondents were women (Table 4.3). Although private trips tended to have fewer women than commercial trips, the difference was not statistically significant. About one-quarter of each group (except guides) was single, while about two-thirds were married. The average age for those surveyed (i.e., those at least 15 years old) was 43 within each group, except guides. Commercial passengers on average had more children than private boaters.

Additional sociodemographic differences among the groups emerged for education (Table 4.4) and income (Figure 4.1). Although similar proportions had education up to "some college," more private boaters had completed their education with a college degree, while 18% of commercial passengers had continued on for a degree at the Ph.D. level. Although statistically significant, the difference between private and commercial boaters seems minimal in a practical sense, especially in contrast to the proportions of the U.S. population achieving each level of education. Only 21% of the U.S. population over the age of 15 has a Bachelors degree or higher (US Census, 1998), compared to 73% of commercial motor, 81% of commercial oar, and 85% of

private boaters. Guides also tended to have a high level of education, with 72% having at least a college degree and 17% having an advanced graduate degree.

Table 4.3 Demographic Information about Respondents

		Guides (n=99)	Motor (n=438)	Oar (n=437)	Private (n=123)	p
		----*Percent*----				
Gender	Male	73	58	56	67	
	Female	27	42	44	33	.006[1]
		----*Percent*----				
Marital Status	Single	53	25	26	23	
	Separated	7	7	11	8	
	Married	34	66	62	68	
	Other	6	2	1	1	.000[1]
Age (Years)		35.8[a]	43.3[b]	43.0[b]	43.0[b]	.000[2]
Number of Children		0.51[a]	1.6[c]	1.2[bc]	1.0[b]	.000[2]

[1] Chi-square test
[2]ANOVA. Numbers with different superscripts within each row are different at α=.05.

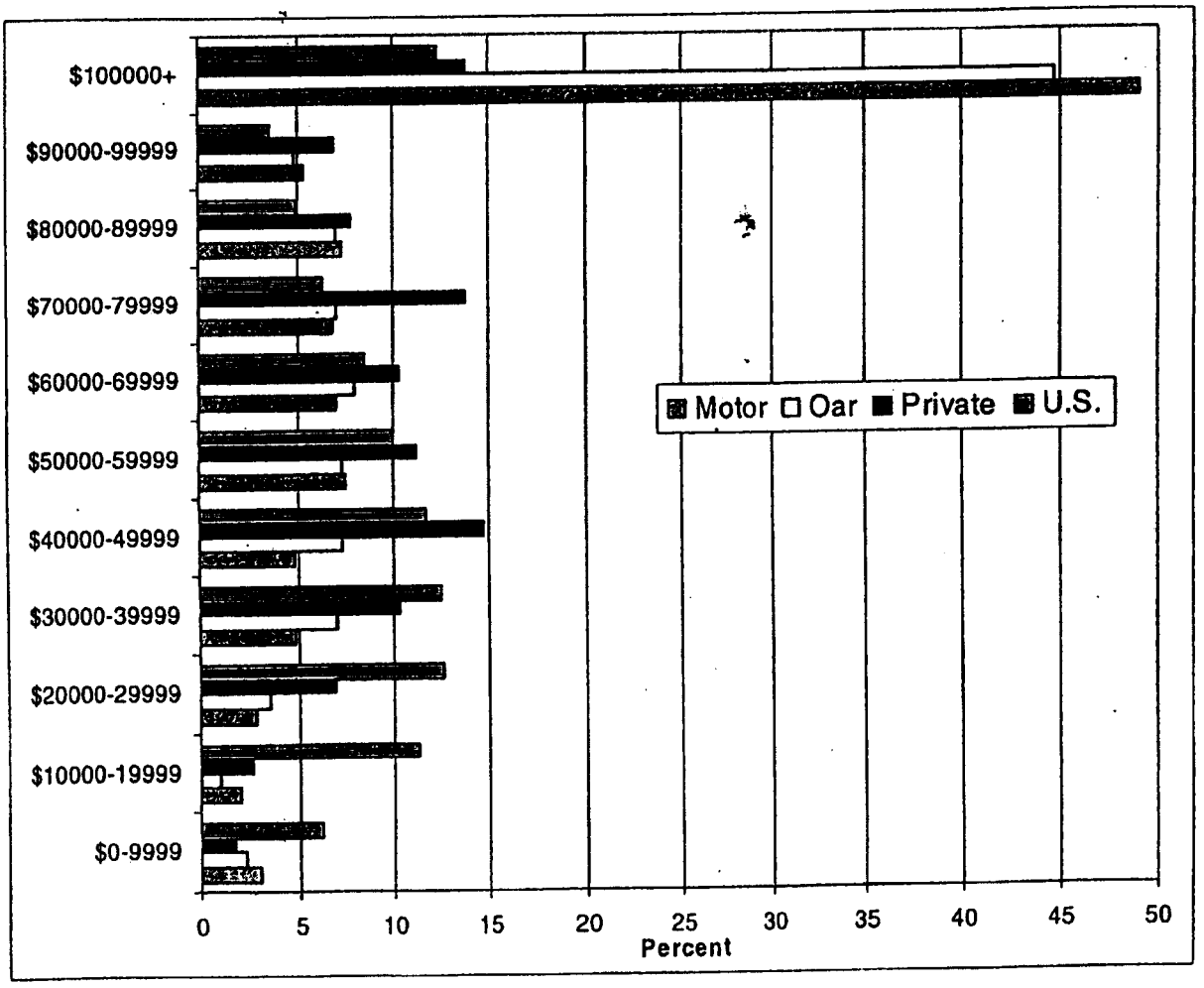
Table 4.4 Education

	Motor	Oar	Private	Guides	US
	----*Percent*-----				
Some high school	4	4	0	3	15
High school diploma	9	3	4	2	32
Some college	15	13	16	23	25
College degree	32	41	45	55	16
Masters degree	23	22	29	13	4
Ph.D., J.D., M.D.	18	18	6	4	1

p<.0005, Chi-square test

Commercial boaters had higher family incomes than private boaters, though both groups had average incomes well above the national average (Figure 4.1). The most notable difference was in the proportion earning family incomes (before taxes) of more than $100,000 per year: 45-50% of commercial boaters, versus 14% of private boaters and 12% of the U.S. population, are in this income bracket.

Figure 4.1 Income



Approximately 5% of commercial motor passengers and 10.5% of commercial oar passengers do not live in the United States (Table 4.5). The rest come from across the country. The average one-way distances traveled (for those who indicated living within 4,000 miles of the canyon) were 1,395 miles (commercial motor), 1,521 miles (commercial oar), and 810 miles (private boaters). That is, private boaters are more likely to be from the west.

Table 4.5 Distance Lived from Grand Canyon

	Motor (n=410)	Oar (n=415)	Private (n=122)
	-----Percent-----		
Live outside US	5.3	10.5	1.6
≤100 miles	1.4	0.9	4.0
101-500 miles	17.6	13.7	25.0
501-1000 miles	19.7	17.6	46.0
1001-2000 miles	38.7	36.3	21.0
2001-3000 miles	15.7	18.9	2.4
> 3000 miles	1.6	2.1	0.0
	-----Number of Miles-----		
Average (Std. Dev.)	1395 (792)	1521 (803)	810 (561)
Median	1500	1600	700

About 40% of all respondents indicated that they belong to at least one outdoor or conservation organization, but there were significant differences between the three groups (Table 4.6). For example, private boaters were more than twice as likely to belong as commercial motor trip passengers. Just over three-quarters of the guides (78%) belong to an organization of this

type; for many this may be Grand Canyon River Guides Association (information was not collected about the specific organizations to which boaters belong).

Table 4.6 Membership in Outdoor or Conservation Organizations

	Motor (n=435)	Oar (n=434)	Private (n=122)	Guides (n=99)
	----*Percent*----			
Do not belong	73	56	39	23
Belong	27	44	62	77

p<.0005, Chi-square test

Outdoor Recreation Setting and Activity Preferences

Several questions were directed at understanding what types of activities and settings Grand Canyon boaters typically prefer. Very few respondents expressed a preference for highly developed recreation settings for outdoor recreation (Table 4.7). However, there were significant differences between the groups in preferences for other types of settings. Private boaters' preference for roadless areas was particularly notable – about twice as many private (65%) as commercial (32-36%) boaters preferred this type of setting when recreating outdoors. Commercial passengers were more likely to prefer moderately developed recreation settings (34-39%, versus 11% for private boaters). Commercial motor and oar passengers were quite similar to each other, and quite different from private boaters.

Table 4.7 Preferences for Outdoor Recreation Settings

	Motor (n=418)	Oar (n=407)	Private (n=122)
	-----Percent-----		
Highly developed recreation sites, with many facilities and visitor services	9	6	0
Recreation sites that have roads and some facilities (such as campgrounds) but no major developments	39	34	11
Areas that have roads but no other developments	20	25	25
Roadless backcountry or wilderness	32	36	65

p<.0005, Chi-square test

The questionnaire provided respondents with a list of 20 activities and setting characteristics and asked how much they personally enjoy them in their outdoor recreation (Table 4.8). The 9-point scale ranged from -4 (dislike very much) to +4 (like very much). Several of the items were drawn from Hendee et al.'s 1968 study of "wilderness" (how much people are drawn to wilderness environments, as defined by the 1964 Wilderness Act) among wilderness backpackers. For all but two of the items, at least two of the the three groups of boaters differed significantly from each other. In almost every case, private boaters and commercial motor passengers differed the most, while commercial oar passengers were intermediate. Nevertheless, the ranking of items was similar for the three groups. (For example, enjoyment of nature and taking river trips were the top two items for all three groups, while remote setting, vast areas with great vistas, and absence of manmade features were next.) Thus, it is not so much that the groups differed in their most preferred activities and settings (at least among the choices provided in our survey), but that they differed in intensity of preference. The first 8 items (enjoying nature to visiting state parks) were enjoyed by more than 80% of all three groups, but private boaters liked mountain climbing, backpacking, and steep, unpaved trails more than the other two groups.

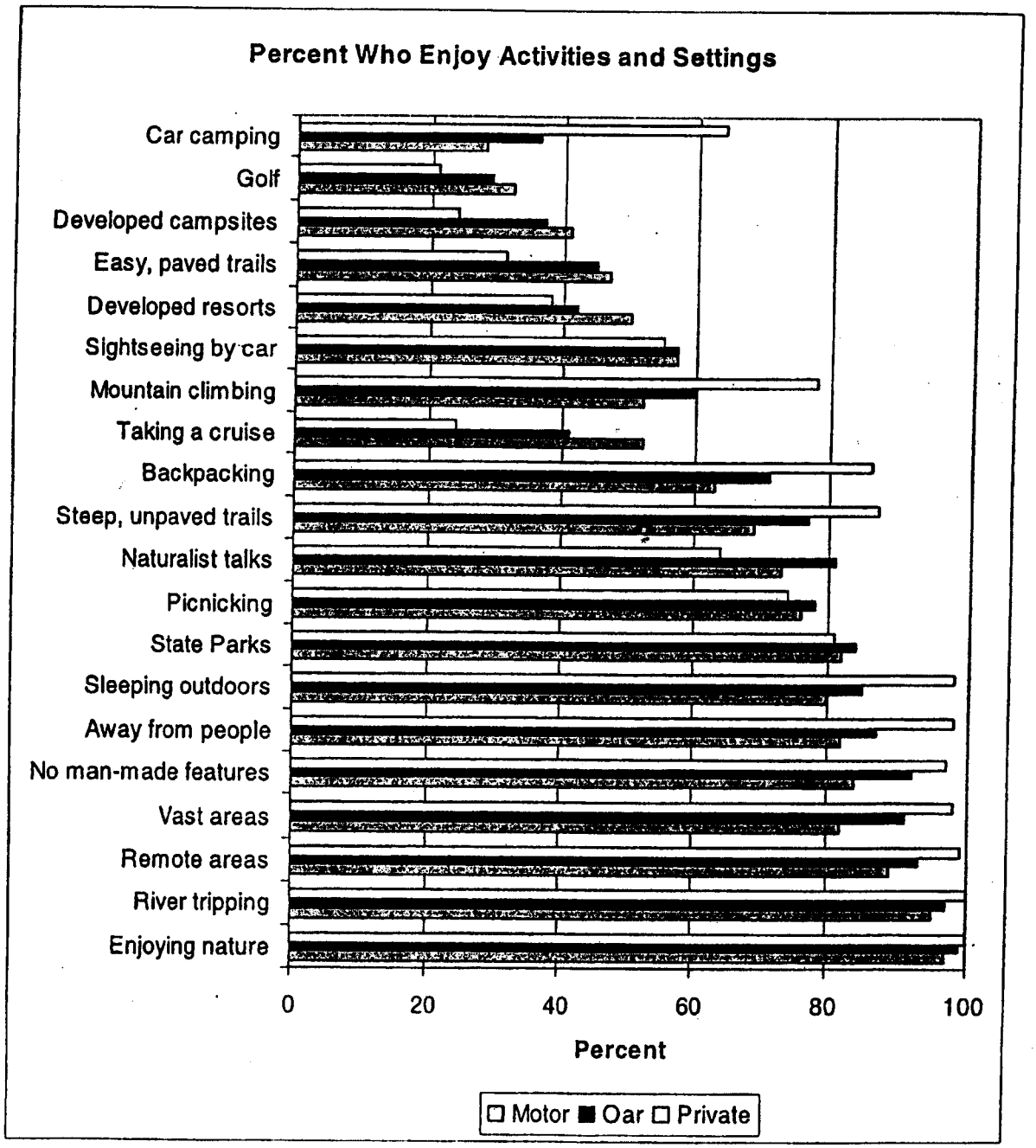
Figure 4.2 presents the percentage of each group indicating a positive response (+1 to +4) on the 9-point scale. Among the least preferred items there were some other differences. Motor passengers on average liked resorts, easy trails, and cruises, while oar passengers were neutral toward these activities and private boaters slightly disliked them. Motor and oar commercial passengers tended to dislike car camping, while private boaters enjoyed this activity.

Table 4.8 Mean level of Preference[1] for Outdoor Recreation Activities and Setting Characteristics

	Motor (n=436)	Oar (n=425)	Private (n=123)	p^2
Enjoying nature	3.38[a]	3.51[a]	3.80[b]	.000
River tripping	3.12[a]	3.20[a]	3.81[b]	.000
Being away from civilization, in remote areas	2.69[a]	3.05[b]	3.68[c]	.000
Being in a vast area with enormous vistas	2.63[a]	3.10[b]	3.60[c]	.000
Absence of manmade features	2.59[a]	3.05[b]	3.51[c]	.000
Being away from other people	2.19[a]	2.56[b]	3.23[c]	.000
Sleeping outdoors	2.14[a]	2.43[a]	3.50[b]	.000
Visiting historic or developed State Parks	2.03[a]	2.13[a]	1.65[b]	.021
Picnicking	1.82[a]	1.91[a]	1.70[a]	.44
Hearing naturalist talks	1.70[a]	2.14[b]	1.31[a]	.000
Hiking on steep, rugged, unpaved trails	1.32[a]	1.83[b]	2.40[c]	.000
Backcountry camping (backpacking)	1.28[a]	1.85[b]	2.94[c]	.000
Taking a cruise	0.83[a]	-0.08[b]	-1.15[c]	.000
Mountain climbing	0.64[a]	1.10[a]	1.91[b]	.000
Sightseeing by car	0.61[a]	0.48[a]	0.59[a]	.67
Staying at developed resort facilities	0.46[a]	0.00[a]	-0.59[b]	.000
Hiking on easy, paved trails	0.23[a]	0.07[ab]	-0.32[b]	.08
Staying at campsites with water and electric hookups	-0.03[a]	-0.35[a]	-1.06[b]	.000
Playing golf	-0.58[a]	-1.11[ab]	-1.70[b]	.000
Car camping	-0.87[a]	-0.58[a]	1.20[b]	.000

[1]9-point scale: +4 (strongly like), 0 (neutral), -4 (strongly dislike)
[2]ANOVA. Numbers with different superscripts within each row are different at α=.05.

Figure 4.2 Percent of Respondents who Enjoy Outdoor Recreation Activities and Setting Characteristics



These questions suggest that private boaters have the strongest affinity for wilderness-type environments, followed by commercial oar passengers. All boaters appear quite different from the typical US resident (Table 4.9), as reported in the recent National Survey on Recreation and the Environment (Cordell et al. 1999). For example, only 8% of the US population engages in either rafting or backpacking. Conversely, more than 60% of Grand Canyon boaters have been backpacking. About three-quarters of the boaters enjoy picnicking, compared to only 49% of the US population. These findings are not highly surprising, but do indicate (along with education and income) that Grand Canyon boaters are not representative of the US population at large.

Table 4.9 Comparison of Grand Canyon Boaters and the US Population in Participation in Selected Activities

Activity	Motor	Oar	Private	US[1]
	-----*Percent*-----			
River tripping ("rafting" for US population)	95	97	100	8
Picnicking	76	78	74	49
Hiking on steep, rugged, unpaved trails	69	77	87	24[2]
Hiking on easy, paved trails	47	45	31	
Backcountry camping (backpacking)	63	71	86	8
Mountain climbing	52	60	78	5
Sightseeing by car	57	57	55	57
Car camping	28	36	64	26

[1]Source: Cordell et al. 1999.
[2]In the national survey, the item is "hiking"

Past Experience on Rivers

Approximately 80% of both groups of commercial passengers were on their first Grand Canyon river trip when surveyed, compared to 39% of private boaters (Table 4.10). Very few of the commercial motor or oar passengers had been down the river more than once or twice, while 24% of private boaters had been at least three times previously. This is consistent with popular wisdom that the cancellation policy in effect during 1998 favored local boaters and permitted many to obtain permits or trips every year. However, other explanations are possible as well, for example, that private boaters have a longer river running history in general, greater experience, or greater commitment to boating than commercial passengers.

Table 4.10 Number of Past Trips on the Colorado River in the Grand Canyon

Number of Trips	Motor (n=443)	Oar (n=431)	Private (n=124)
	-----*Percent*-----		
None	82	79	39
1	12	14	23
2	2	3	14
3+	3	4	24

$p<.0005$, Chi-square test

A similar pattern of experience levels is evident for past experience on other rivers (Table 4.11). Thirty-eight percent of motor passengers and 27% of oar passengers had never been on any other whitewater river trip, while only 6% of private boaters were this inexperienced. In contrast, 86% of private boaters had been on more than four other whitewater river trips. In this

case, oar passengers were intermediate in experience between motor passengers and private boaters, though they were more similar to the motor passengers. Thus, private boaters had the most boating experience, in general and in the Grand Canyon, while oar passengers had more experience on other rivers than motor trip passengers.

One might expect the high level of experience among private boaters to be characteristic of those actually rowing or leading trips; the Colorado River is sufficiently difficult that boaters should have a reasonable level of experience with that class of water. However, it is interesting that other passengers on private trips also had more experience than commercial passengers.

Table 4.11 Number of Trips on Other Rivers

Number of Trips	Motor (n=442)	Oar (n=429)	Private (n=124)
	-----Percent-----		
None	38	27	6
1	22	17	2
2-3	22	28	7
4+	19	28	86

$p<.0005$, Chi-square test

Consistent with their overall greater river experience, private boaters had been on many more different rivers than commercial passengers (Table 4.12). More than 40% had run Westwater Canyon, the San Juan, the Middle Fork of the Salmon, and Cataract Canyon, compared to 5% or less of commercial passengers. More distant rivers like the Snake, Deschutes, and Rogue were less commonly run by any respondents.

Table 4.12 Percent of Respondents with Boating Experience on Specific Rivers

	Motor (n=441)	Oar (n=426)	Private (n=118)	p[1]
	----*Percent*----			
Westwater Canyon	2	1	57	.000
San Juan	2	3	44	.000
Middle Fork Salmon	5	5	44	.000
Cataract Canyon	3	2	43	.000
Main Fork Salmon	4	3	36	.000
Rogue	4	7	23	.000
Snake	6	6	11	.054
Deschutes	5	5	11	.037
None	39	27	5	.000

[1]Chi-square test

Table 4.13 Number of Respondents Listing Other Rivers Boated

	Motor	Oar	Private		Motor	Oar	Private
American	16	39	5	McKenzie	4	2	3
Animas	2	2	4	Merced	2	3	2
Arkansas	24	11	21	Nanaimo	7	0	0
Blackfoot	1	3	1	Nantahela	7	15	5
Brule	3	2	0	New	3	37	6
Chama	0	1	6	Ocoee	5	16	7
Chatooga	8	17	9	Owyhee	0	2	7
Cheat	2	11	0	Payette	1	2	5
Colorado – other	16	6	6	Penobscot	1	9	0
Dead	0	6	0	Platte	0	0	14
Delaware	6	4	0	Poudre	0	0	7
Dolores	1	0	20	Rio Grande	11	8	12
Flathead	3	5	1	Salt	8	1	14
French Broad	0	5	0	Selway	3	1	26
Gallatin	2	3	3	Snake – other	11	25	5
Gauley	3	25	5	Stanislaus	3	7	0
Green	19	16	56	Tatsenshini	0	0	5
Gunnison	2	0	3	Tuolomne	2	7	5
Hudson	3	4	0	Umpqua	1	1	5
Illinois	0	0	6	Wenatchee	4	0	1
John Day	4	3	2	West	5	0	0
Kennebec	0	13	0	White	2	1	4
Kern	3	7	4	Wolf	3	2	0
Kings	4	1	1	Yampa	11	4	34
Klamath	2	3	3	Youghegany	7	14	1
Lehigh	4	4	0	Zambezi	2	6	0
Lochsa	2	3	7				

Boaters were asked to name other rivers they had boated, which generated a long list of rivers (Table 4.13). Some rather interesting differences emerged among the groups in these responses. For example, commercial oar passengers often listed rivers across the country, including the American, Chatooga, Gauley, Green, New, Ocoee, and segments of the Snake River, while commercial motor passengers were more likely to list western rivers such as the American, Arkansas, Colorado, and Green. Private boaters, in addition to the Arkansas and Green, were likely to have run the Dolores, Selway, and Yampa Rivers. Several of the rivers popular with private boaters are in the southwest, which may reflect the higher percentage of local residents among private boaters.

Very few respondents had been on both oar-powered and motorized river trips on any river (Table 4.14). About half of the motor trip passengers, two-thirds of the oar trip passengers, and three-quarters of the private boaters previously had been only on oar trips, but less than 10% of each group had been only on motor trips. For motor trip passengers, all were currently on a motor trip and 61% had done an oar or oar and motor trip on some river. Among oar passengers, on the other hand, only 11% had ever taken a motor trip on a river. Private boaters were similar to oar passengers in this regard; only 18% had ever done a motorized river trip.

Table 4.14 Types of Previous River Trips, Grand Canyon or Other Rivers

	Motor (n=434)	Oar (n=411)	Private (n=124)
	-----*Percent*-----		
Never been	32	24	4
Oar only	47	65	77
Motor only	8	3	3
Both motor and oar	14	8	15

p<.0005, Chi-square test

Wilderness Issues

Understanding of Wilderness

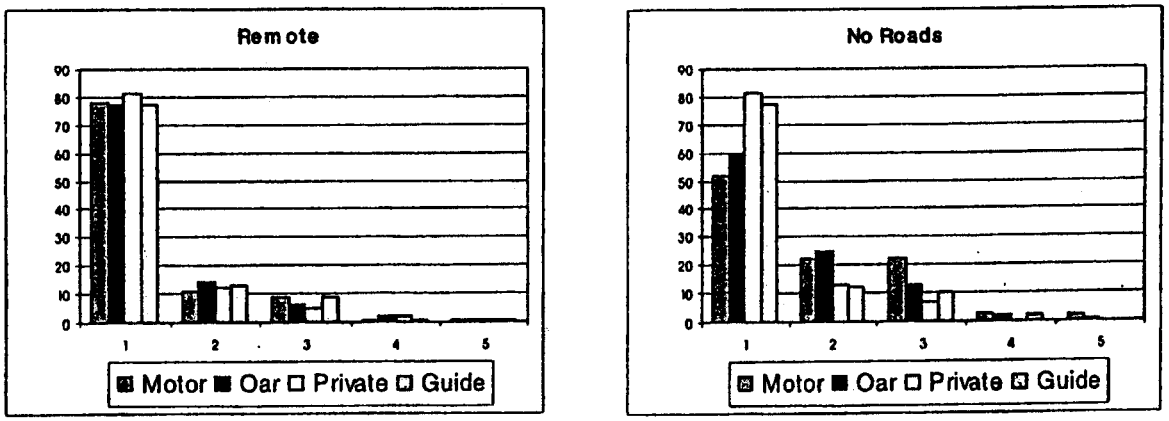
There has been considerable discussion about whether the Grand Canyon provides wilderness-type experiences and what factors influence the sense of wilderness one might experience on the river. Such issues are important, because Congress has not yet acted to designate or release the Grand Canyon, but the National Park Service considers it suitable for wilderness designation in many respects. To help understand boaters' evaluations of the wilderness-like qualities of the Colorado River in the Grand Canyon, the questionnaire asked several questions about personal definitions of wilderness and understanding of the managerial definition of wilderness. Respondents differed in their personal definitions of wilderness, as evidenced by their responses to a set of characteristics that might be considered appropriate in wilderness (Table 4.15 and Figure 4.3). While all three groups considered remote location and wildlife to be central to their image of wilderness, there were significant differences with respect to the presence of roads, developed trails, developed campsites, man-made features, and shelters. In each case, private boaters' and guides' conceptions of wilderness were closer to the definition provided in the 1964 Wilderness Act, which defines wilderness as having minimal human impacts or developments and providing opportunities for solitude and primitive recreation. All of the groups felt that seeing many other people, developed sites, or RV campgrounds were not part of wilderness.

Table 4.15 Features Considered to be Part of Wilderness[1]

	Motor (n=438)	Oar (n=426)	Private (n=120)	Guides (n=103)	p^2
Presence of wildlife	1.25 [a]	1.28 [a]	1.32 [ab]	1.46 [a]	.013
Remote from cities	1.35	1.37	1.30	1.37	.84
Absence of man-made features	1.73	1.55	1.43	1.53	.014
Absence of roads	1.81 [a]	1.60 [ab]	1.26 [c]	1.37 [bc]	.000
Virgin forest	1.92 [ab]	1.67 [a]	1.72 [ab]	1.99 [b]	.001
Rugged terrain	1.95	1.92	1.94	1.91	.952
Freedom to go where you want and do what you want	2.28 [a]	2.26 [a]	2.13 [ab]	1.85 [b]	.011
Primitive shelters for camping	3.33 [a]	3.49 [a]	4.37 [b]	4.50 [b]	.000
Well-developed, wide trails	3.80 [a]	4.06 [ab]	4.49 [c]	4.33 [bc]	.000
Seeing many other people	4.02 [a]	4.33 [ab]	4.41 [b]	3.68 [c]	.000
Developed campsites with plank tables and cement fireplaces	4.22 [a]	4.38 [a]	4.80 [b]	4.78 [b]	.000
Campgrounds with RV hookups	4.49 [a]	4.66 [ab]	4.90 [c]	4.82 [bc]	.000

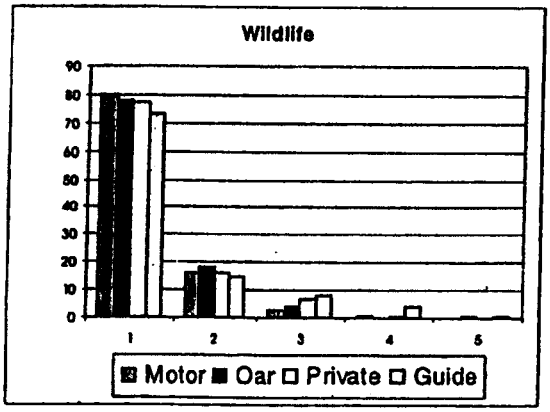
[1] Mean on 5-point scale: 1 (a big part), 3 (a small part), 5 (not a part at all)
[2] ANOVA. Numbers with different superscripts within each row are different at α=.05.

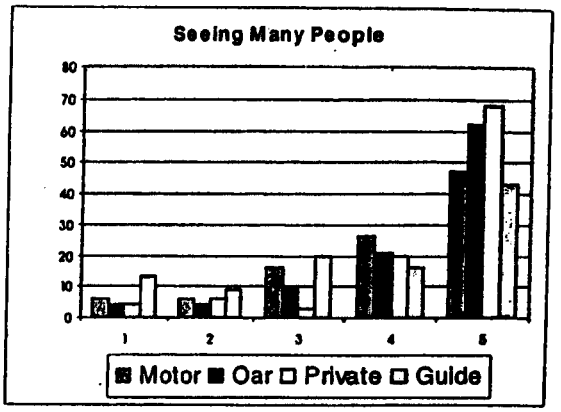
Figure 4.3 Importance of Features in Personal Definitions of Wilderness[1]

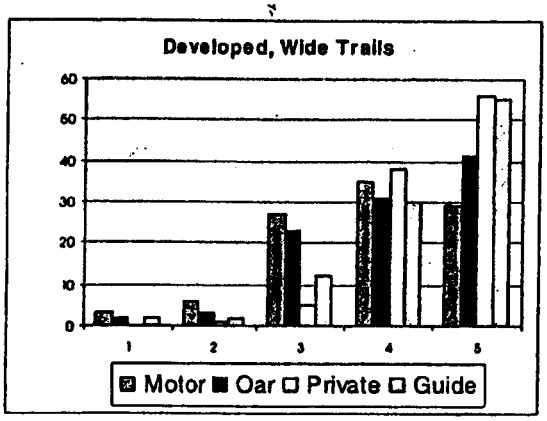


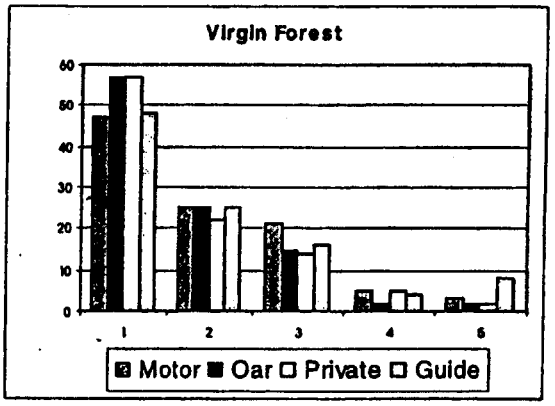
[1] Scale where 1 = a big part, 3 = a small part, and 5 = not a part at all of one's definition of wilderness

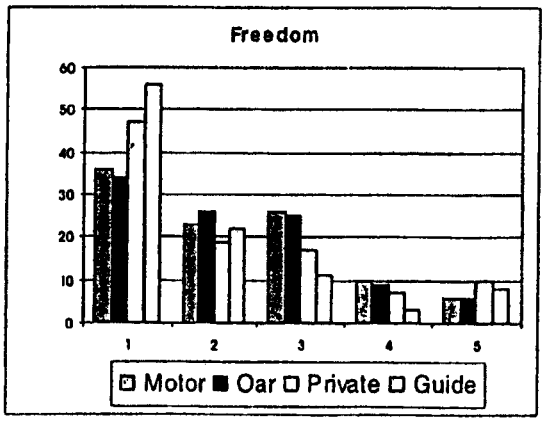
Figure 4.3 Continued











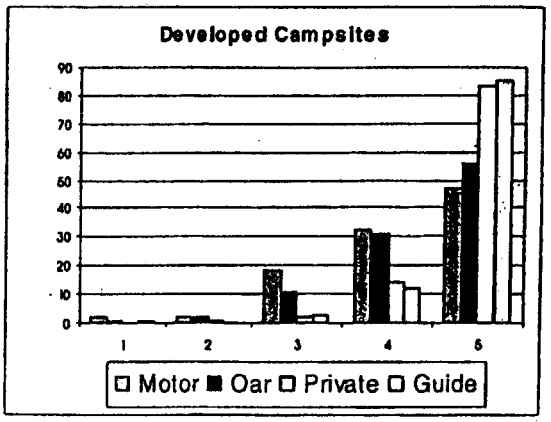
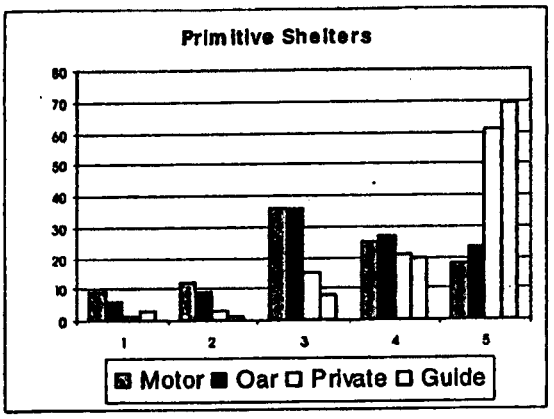
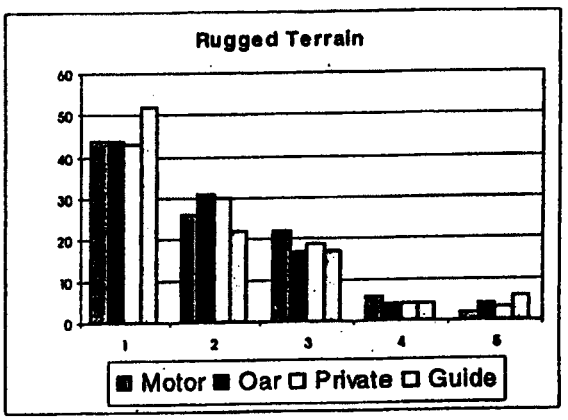
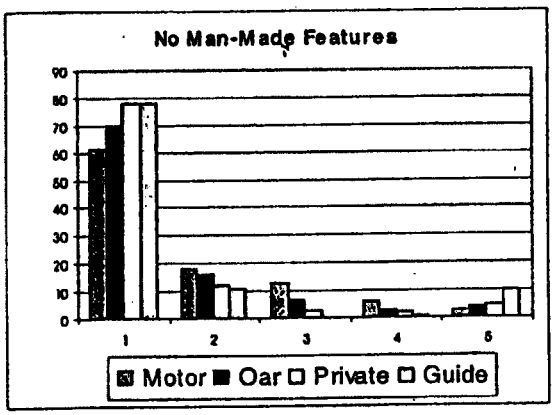
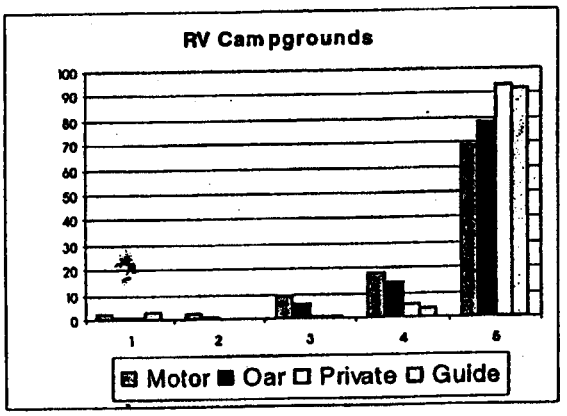


Figure 4.3 Continued









The above question asked respondents to indicate how much each feature or characteristic was part of their personal image or definition of wilderness. Another question asked how familiar respondents felt they were "with the legal definition of Wilderness used by the National Park Service." Private boaters on average believed they were familiar with the federal definition (80% said they know a little or a lot), while many commercial passengers said they either had no idea what wilderness is, or had only heard the term (Table 4.16). Commercial guides and private boaters on average assessed their own knowledge of wilderness at similar levels. Commercial oar and commercial motor passengers did not differ from each other.

Table 4.16 Self-Assessed Knowledge of the Federal Definition of Wilderness

Knowledge Level	Motor (n=436)	Oar (n=426)	Private (n=123)	Guides (n=110)
	-----*Percent*-----			
I have no idea -- I didn't even know there was a land classification of "Wilderness"	32	28	6	4
I have heard of Wilderness areas, but I don't know anything about the specific definition	43	41	17	16
I know a little bit about what legally classified Wilderness is	18	25	41	37
I think I know a lot about the legal definition of Wilderness	7	5	36	43

p<.0005, Chi-square test

To further understand how boaters conceptualize wilderness, the survey asked them (in an open-ended question) to identify the place or area in the United States that they think best exemplifies a wilderness area (Table 4.17). The single most common responses were "Alaska" and "Grand Canyon." Between 20 and 35% listed Alaska or a place within Alaska. Among commercial boaters, 35% cited the Grand Canyon as the best example of wilderness. Very few respondents named actual units of the National Wilderness Preservation System, although four times as many private as commercial boaters did so. The most commonly mentioned designated wildernesses were the Boundary Waters Canoe Area and the Bob Marshall. Several respondents listed National Parks that have wilderness, typically Yosemite or Denali. About the same number listed National Parks that do not have formal wilderness, although some of these (such as Yellowstone and Glacier) have large, undeveloped backcountry areas. Many answered this question by referring to "the west" or specific mountain ranges, such as the Wind Rivers, Tetons, Rockies, or Sierra Nevada.

Table 4.17 Best Example of Wilderness

	Motor (n=361)	Oar (n=364)	Private (n=111)	Guides (n=96)
	----*Percent*----			
"Alaska" or a place in Alaska	20	24	32	35
Grand Canyon	36	35	7	12
Non-NPS unit of the NWPS	8	9	32	17
National Park with designated wilderness	9	11	5	1
National Park without designated wilderness	9	11	5	3

Taken together, the above responses suggest that many boaters, especially private boaters, share a general understanding of the features of wilderness that is largely consistent with the 1964 Wilderness Act, but that they may not have a clear idea of where federal wilderness areas are.

Two other questions asked about respondents' personal experiences in wildernesses: how often they take wilderness trips (number of trips per year) and how long since their first wilderness trip. Given the lack of knowledge about the legal status of many areas, these responses should be viewed as referring to personally-defined wilderness rather than federally-classified wilderness.

About 15% of commercial passengers said they had never been to a wilderness (Table 4.18), while 28% said they go less than once every two years, and about one-quarter said they go more than once a year. Commercial motor and oar passengers did not differ significantly. In contrast, 78% of private boaters said they take more than one wilderness trip per year, and 13% said they take more than 10 trips each year.

Table 4.18 Frequency of Wilderness Trips

	Motor (*n*=443)	Oar (*n*=428)	Private (*n*=122)
	----*Percent*----		
Never	18	12	0
Less than once every two years	28	28	7
Less than once a year	12	14	6
Once a year	19	17	10
2-5 times a year	19	21	51
6-10 times a year	2	4	14
More than 10 times a year	2	4	13

p<.0005, Chi-square test

Most of those (in all three groups) who had been to wilderness said their first trip was more than five years ago (Table 4.19). Nearly all private boaters said they had this level of experience. Guides were also asked this question; 94% said their first trip was at least six years before.

Table 4.19 Years Since First Wilderness Trip, For Those Who Had Taken Wilderness Trips

	Motor (*n*=370)	Oar (*n*=378)	Private (*n*=123)	Guides (*n*=103)
	----*Percent*----			
Less than one year	8	7	1	2
1-2 years	9	8	2	1
2-3 years	7	5	0	0
4-5 years	7	5	2	3
6+ years	69	74	96	94

p<.0005, Chi-square test

Perception of Wilderness Qualities in Grand Canyon

Several items asked respondents to evaluate the wilderness qualities of the Grand Canyon on a 4-point scale with response categories of agree, slightly agree, slightly disagree, and disagree (Table 4.20). Some highly significant differences emerged among the different groups. While only 37% of private boaters agreed that "the canyon seems relatively unaffected by the presence of man," 82% of motor passengers and 73% of oar passengers agreed with this statement (Figure 4.4). Nearly all commercial boaters (93% of motor and 91% of oar passengers) agreed that they would "consider the Grand Canyon area of the Colorado River a 'wilderness,'" but only 56% of private boaters agreed with this statement. (Despite the difference among groups, more than half of all respondents from all three groups agreed with this statement.) Most motor passengers (76%) disagreed that "the canyon would be more of a wilderness if use were more restricted," while 45% of oar passengers and 57% of private boaters agreed with the statement. Similarly, only 24% of motor passengers, but 74% of oar passengers and 85% of private boaters felt that "the canyon would be more of a wilderness if motor travel were banned." It is interesting that more than half of the motor passengers defined wilderness as an area without roads in an earlier question, but more than 75% thought the canyon would *not* be more of a wilderness if motor travel was banned. Finally, it appears that crowding detracted from the sense of wilderness for many private boaters but not for commercial passengers. Only 11% of motor passengers and 17% of oar passengers agreed that "the canyon is too crowded to be considered wilderness," but half of the private boaters agreed with this statement.

Responses by guides to these questions were intermediate. Like private boaters, on average they disagreed that the canyon was "unaffected," and similar percentages of the two

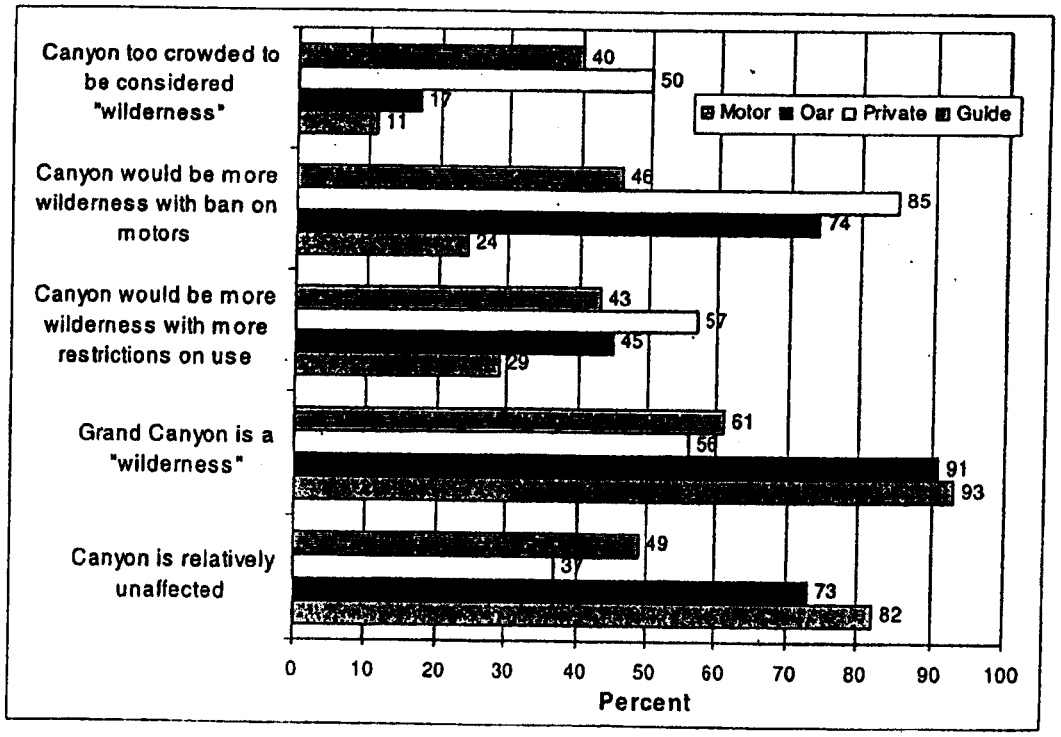
groups would consider the canyon a wilderness. However, more like motor passengers, they felt that eliminating motors would not make the canyon feel more like wilderness.

Table 4.20 Perception of Wilderness Qualities in the Grand Canyon[1]

	Motor (n=464)	Oar (n=442)	Private (n=112)	Guides (n=103)	p^2
The canyon seems relatively unaffected by the presence of man	.98 [a]	.59 [b]	-.46 [c]	-.12 [c]	.000
I would consider the Grand Canyon area of the Colorado River a "wilderness"	1.49 [a]	1.40 [a]	.16 [b]	.24 [c]	.000
The canyon would be more of a wilderness if use were more restricted	-.68 [a]	-.19 [b]	.24 [c]	-.30 [ab]	.000
The canyon would be more of a wilderness if motor travel were banned	-.89 [a]	.80 [b]	1.28 [c]	-.13 [b]	.000
The canyon is too crowded to be considered "wilderness"	-1.33 [a]	-1.00 [a]	.07 [b]	-.25 [b]	.000

[1] Mean on 4-point scale: +2 (strongly agree), +1 (probably agree), -1 (probably disagree), -2 (strongly disagree)
[2] ANOVA. Numbers with different superscripts within each row are different at α=.05.

Figure 4.4 Percent Agreeing With Statements about Wilderness Qualities in Grand Canyon



In a question specifically asking what type of setting the Colorado River in the Grand Canyon currently provides, most boaters did *not* feel it is wilderness, when wilderness was defined as "a place generally unaffected by the presence of people, providing outstanding opportunities for solitude and self-reliance" (Table 4.21). (This definition has been used in several other studies.) However, almost half of motor passengers and 41% of oar passengers felt that it does currently provide such a wilderness experience. Thus, although more than 90% of these boaters said in a previous question that offered no definition of wilderness that they would consider the Grand Canyon a "wilderness," when wilderness was later defined as including solitude and self-reliance, many changed their opinions. This instability of response may result either from the different definitions of wilderness implied by the two questions (personal vs. policy), or the general lack of clarity among commercial passengers about the managerial definition of wilderness (which includes solitude).

All groups of boaters exhibited the same patterns of responses across questions about wilderness, with a majority saying the Canyon is wilderness in the general question but fewer saying this under the restricted definition. This suggests that they had different concepts in mind when answering the two questions. In retrospect, it is possible that the definition of "semi-wilderness" offered here is consistent with some managers' definitions of wilderness, because of the qualification about "complete" solitude. (Although, according to the Wilderness Act, wilderness should provide solitude, it is not required to provide "complete solitude.") Therefore, one should use caution in interpreting the results presented in Table 4.21.

Most private boaters and guides felt that the Canyon offers "the kind of place where complete solitude is not expected, but the environment appears mostly unaffected by people," which we chose to call "semi-wilderness" following previous research. Interestingly, about one-

quarter of the private boaters and guides felt that the Canyon provides "undeveloped recreation – the kind of place where a natural setting is provided but meeting other people is part of the experience." The differences between commercial passengers as a whole and private boaters and guides are striking.

Table 4.21 Opinions About the Type of Experience Currently Provided on the Colorado River in Grand Canyon

	Motor (n=438)	Oar (n=416)	Private (n=123)	Guides (n=107)
	-----*Percent*-----			
Wilderness -- a place generally unaffected by the presence of people, providing outstanding opportunities for solitude and self-reliance	49	41	13	23
Semi-wilderness -- the kind of place where complete solitude is not expected, but the environment appears mostly unaffected by people	44	50	64	53
Undeveloped recreation -- the kind of place where a natural setting is provided but meeting other people is part of the experience	7	9	23	23

p<.0005, Chi-square test

A subsequent question asked boaters what experience the canyon *should* provide(Table 4.22), using the same definitions of wilderness, semi-wilderness, and undeveloped recreation as in the previous question about the experience actually provided. A slim majority of oar passengers, but less than 50% of motor trip or private boaters felt the Grand Canyon should be a place generally unaffected by the presence of people, providing outstanding opportunities for solitude. A small number believed it should be managed for "undeveloped recreation," while 46-56% said it should provide "semi-wilderness."

Table 4.22 Opinions About the Type of Experience That *Should* Be Provided on the Colorado River in Grand Canyon

	Motor (*n*=433)	Oar (*n*=422)	Private (*n*=122)	Guides (*n*=101)
	-----*Percent*-----			
Wilderness -- a place generally unaffected by the presence of people, providing outstanding opportunities for solitude and self-reliance	47	51	41	33
Semi-wilderness -- the kind of place where complete solitude is not expected, but the environment appears mostly unaffected by people	47	46	52	57
Undeveloped recreation -- the kind of place where a natural setting is provided but meeting other people is part of the experience	7	3	7	10

p=.003, Chi-square test

Table 4.23 contrasts respondents' evaluations of the experience they felt is currently provided on the river with what they thought should be provided. As is often found in survey research among visitors, most respondents believed the experience currently provided is appropriate. For example, 87.5% of those who felt the river now offers a "wilderness" experience believed it should continue to do so. However, 11% of those feeling the river now offers "wilderness" thought it should provide a "semi-wilderness" experience. The largest discrepancy occurred for those who thought the river now offers "undeveloped recreation." Only 35% of this group believed that is the appropriate experience; 19% believed the river should be "wilderness" and 45% believed it should be "semi-wilderness". Together, the answers to these two questions suggest that about half of the boaters felt the Colorado River should be managed to provide wilderness-like qualities. About half of the commercial passengers thought this is what now occurs, but few private boaters agreed with that assessment. However, despite a general

desire for wilderness-like experiences, the view is not one of unanimous preference for complete solitude.

Table 4.23 Comparison of Experience Currently Offered With Experience That Should Be Offered

Experience Desired	Experience Currently Provided		
	Wilderness (n=423)	Semi-Wilderness (n=528)	Undeveloped Recreation (n=119)
	-----Column Percent-----		
Wilderness -- a place generally unaffected by the presence of people, providing outstanding opportunities for solitude and self-reliance (n=498)	87.5	19.9	19.3
Semi-wilderness -- the kind of place where complete solitude is not expected, but the environment appears mostly unaffected by people (n=516)	11.1	78.6	45.4
Undeveloped recreation -- the kind of place where a natural setting is provided but meeting other people is part of the experience (n=56)	1.4	1.5	35.3

p<.0005, Chi-square test

One might wonder whether those who felt the Canyon now offers "wilderness" were less "purist" than those who felt it offers a less wild experience. To explore this possibility, respondents were categorized by the type of experience they believed now occurs (wilderness, semi-wilderness, and undeveloped recreation, as defined above), and their beliefs about features and aspects of wilderness were compared. (Those questions were presented, by type of trip, in Figure 4.3). Among 12 items, for 8 there were no statistically significant differences between the three groups. Thus, all equally agreed that "seeing many other people" is not part of wilderness

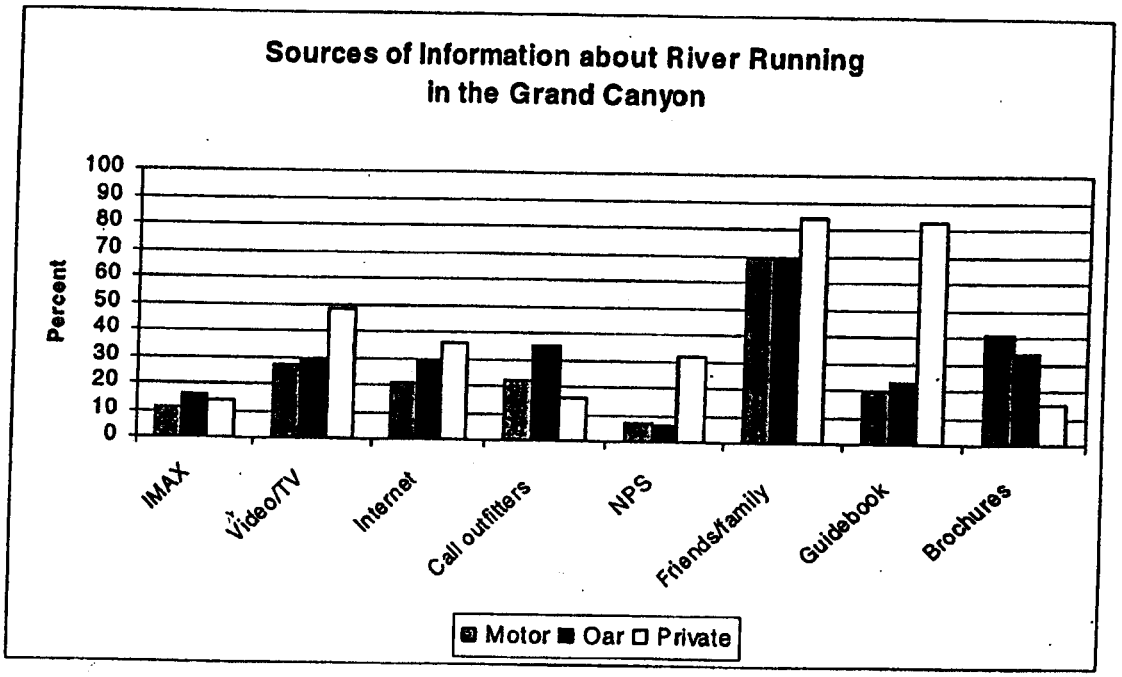
and that "rugged terrain" is. Where differences emerged, they concerned the place of developments in wilderness. For example, those who felt the Canyon now offers "undeveloped recreation" rather than "wilderness," felt more strongly that "well-developed, wide trails) are not part of wilderness. Those who felt the Canyon is now wilderness were less likely to disagree that shelters and developed campsites are inappropriate. Interestingly, for three of the four differences, the "wilderness" group differed from the other two groups, while the "semi-wilderness" and "undeveloped recreation" groups did not differ from each other. This suggests that the distinction between "wilderness" and "semi-wilderness" as defined here had some external validity.

Planning for Colorado River Trips

Sources of Information

Respondents were asked to indicate which of a list of eight sources they used to find information about river running in the Grand Canyon. Most boaters relied on friends and family (Figure 4.5). Private boaters were more likely to consult other sources, including videos, internet sites, the National Park Service, and especially river guidebooks. Commercial passengers used fewer sources, but were more likely to call outfitters and examine brochures.

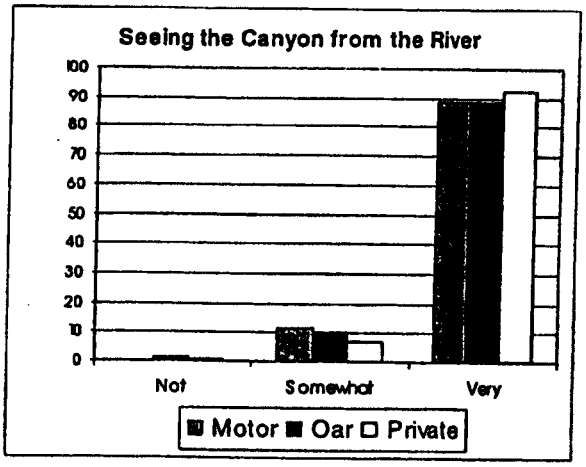
Figure 4.5. Percent Using Each Source of Information about River Running in the Grand Canyon

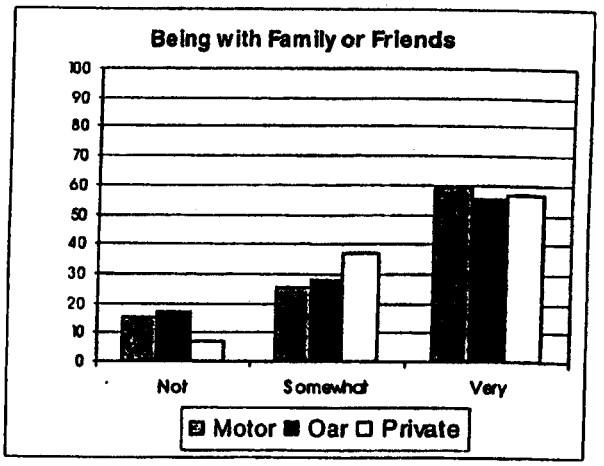


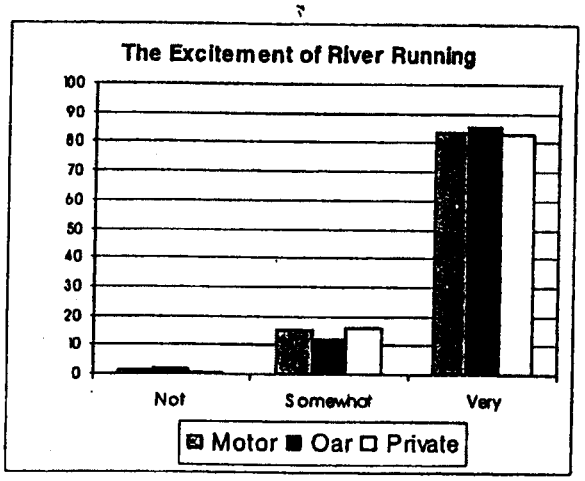
Reasons for Trip

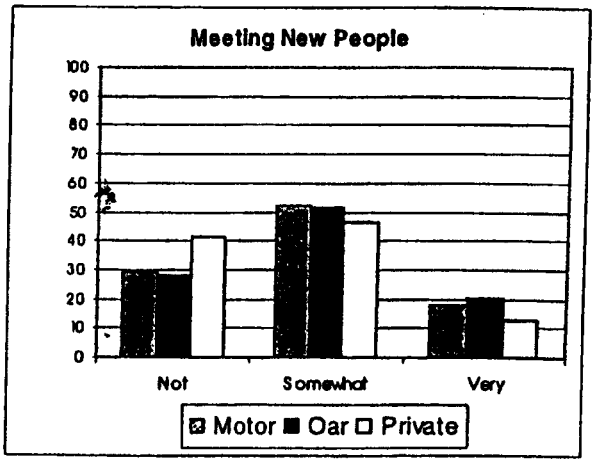
The most important (of six) reasons for doing a river trip – seeing the canyon from the river and the excitement of river running – were the same for all three groups (Figure 4.6). Being in the wilderness was also very important, especially for private boaters. Being with friends and family and escaping the pressures of work or family were less important, although more than half rated being with friends or family as very important, and 35-50% rated escaping pressures to be very important. Of the reasons listed, only meeting new people was not very important.

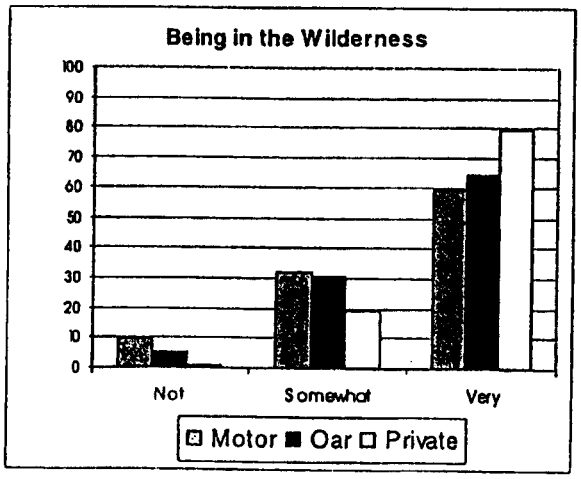
Figure 4.6 Importance of Reasons for Taking a Trip through the Grand Canyon

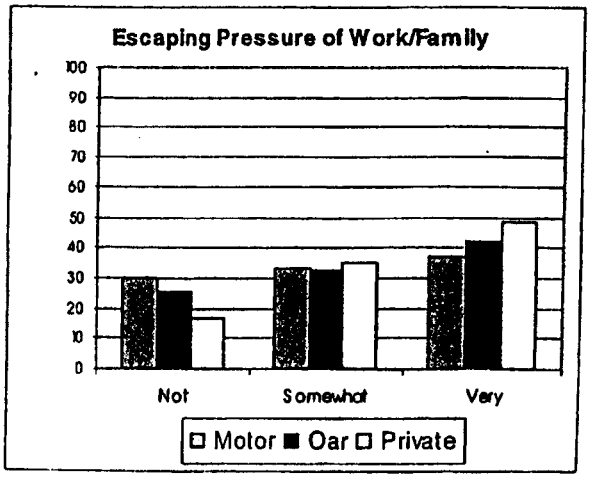








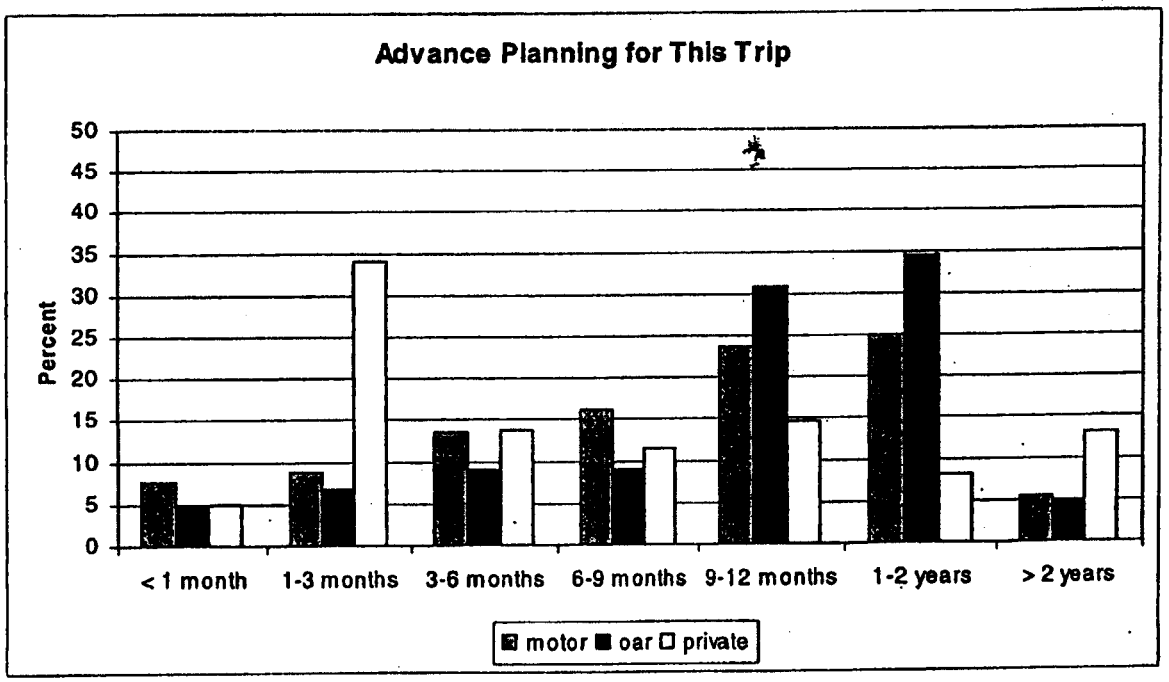




Advance Planning

A considerable concern for the public and river managers is the amount of prior planning and advance notice required to take a Colorado River trip. One survey question asked how long people began planning for their river trip. Very few trips were planned on short notice, and very few were in planning for more than two years (Figure 4.7). The majority (60%) of private boaters planned for one to six months for the trip that they took, while about half (48%) of commercial motor passengers and 65% of commercial oar passengers planned between 9 months and two years ahead.

Figure 4.7 Advance Planning for the Specific Trip



These findings deserve some discussion, because they may be subject to varying interpretations about the implications of the term "planning." The question asked about "planning for this specific trip." It is possible that many private boaters could have been aware of

their opportunity to take a trip much more than two years out, but did not begin "planning" until the date was set. Thus, some of those who said they began planning only a few months ahead may have been referring to the time when they were notified of their specific trip date or were invited on a trip. Similarly, "planning" could also be seen as when one starts organizing gear, food, and equipment for the trip, at least among the private group. Private boaters who picked up cancellation permits also would have had relatively short planning times. Trip leaders, of whom we had 9 among the sample of private boaters, would have the longest advance planning time, and these may have been the private boaters who indicated planning more than two years ahead. (For 1998 trips, trip leaders would have selected their trip date sometime in 1996.) These various considerations (knowing that one will take a trip as separate from knowing the date of the trip) do not seem to apply to commercial passengers, who often reserve a specific date well ahead of time and thus can "begin planning for this specific trip" immediately.

Factors Influencing Choice of Commercial Trip

Among commercial passengers, it is of interest to know what factors influence trip selection. Most motor passengers and a slight majority of oar passengers considered only one commercial company before selecting their trip. Whether or not a person considered more than one company appeared somewhat related to whether they had been down the canyon before. Those who had been on at least one prior trip were more likely to choose a company without considering others (Table 4.24). Although 39% of motor passengers and 48% of oar passengers on their first trip considered more than one company, only 26% of those with at least three previous Grand Canyon trips considered more than one company.

Many respondents probably indicated that they did not consider more than one outfitter because they were not the trip organizer; often several group members allowed another individual to select the trip and make arrangements. Such individuals would not have had the opportunity to select among different companies or trips.

Table 4.24 Percent of Commercial Passengers Who Considered More than One Outfitter

Past Trips in the Grand Canyon	Motor (n=416)	Oar (n=409)	All (n=825)
	----*Percent*----		
0 Previous trips	39	48	43
1 Previous trip	37	45	40
2 Previous trips	30	9	18
3+ Previous trips	27	24	26

For most commercial passengers, trip length, timing (defined as available dates), boat type, and hiking opportunities were most important in selecting the specific trip taken (Figure 4.8). Hiking and type of boat were more important for oar passengers than for motor passengers, while length of trip was more important to motor passengers. Food, equipment, and "special interest" trips were unlikely to be considered by either group. This might indicate that these factors are unimportant, or it might signal that passengers consider each company to be fairly similar in providing food and equipment. Many respondents (51 motor and 88 oar passengers) wrote in other factors that they considered when selecting their trip (Table 4.25). These responses again indicate the importance of other group members' influence.

Figure 4.8 Factors Considered When Selecting Specific Commercial Trip

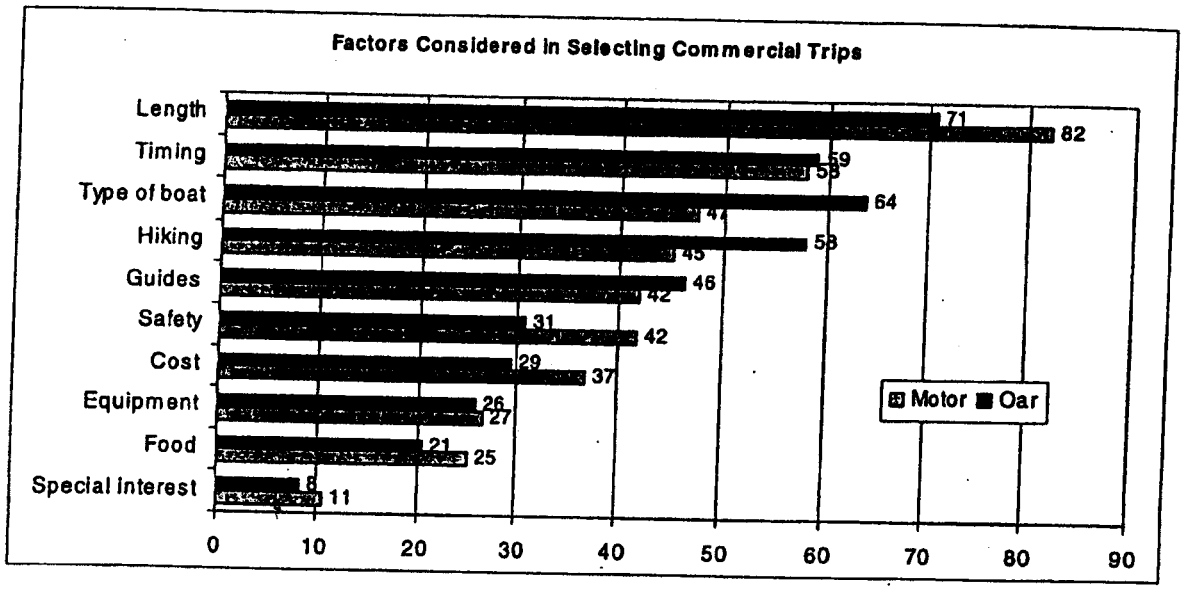
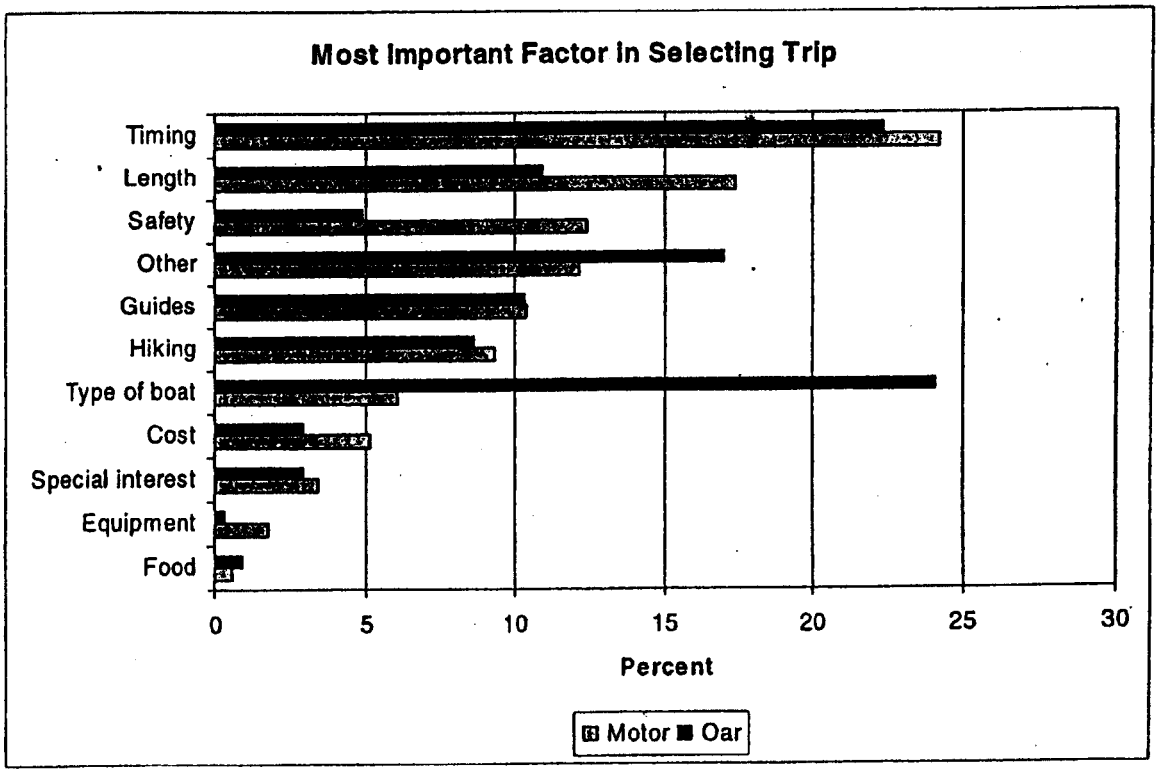


Table 4.25 Importance of Other Factors in Selecting Specific Commercial Trip

Factor	Motor (n=51)	Oar (n=88)
	-----Number of Comments-----	
Chosen by other group member	12	29
Company reputation/recommended	9	9
Able to do the whole river	4	3
Environmental interpretation	3	0
Previous experience with company	2	7
Fits group's time and interest needs	2	4
Personal connection with company	2	3
Not having to hike in or out	2	1
Preparing for a private trips	2	0
Charter trip	2	0
Information provided by company	1	2
No motors	0	6
Able to kayak	0	4
Opportunity to paddle	0	3
No exchanges	0	2
Environmental orientation of company	0	2

Following the question which asked respondents to identify all factors they considered, another question asked which single factor was most important (Figure 4.9). Although most passengers considered trip length when making a selection, timing was ultimately the most important factor for the largest number of people (24% of motor and 22% of oar passengers). There were three significant differences between motor and oar passengers: motor passengers were more likely to stress sense of safety and trip length, while oar passengers were more likely to focus on the type of boat.

Figure 4.9 Most Important Factor in Selecting Specific Commercial Trip



The most important factor varied somewhat by month (Table 4.26). For those on June, July, or August trips, timing (available dates) was most often the primary determinant of choice. However, in September and October, type of boat was important for the most people. Trip length was equally important to people choosing trips in every month of the study period.

Table 4.26 Percent Identifying Each Factor as the Most Important in Selection of Commercial Trip, by Month

	Month				
Factor	June	July	August	Sept.	Oct.
	----*Percent*----				
Timing (dates)	28	29	22	19	21
Trip length	13	14	14	17	15
Type of boat	13	5	16	21	29
Opportunities to hike	11	12	5	16	10
Safety	10	14	8	10	2
Guides' experience	9	6	16	6	8
Special interest	5	4	4	3	0
Cost	2	2	6	4	4
Equipment	2	3	0	0	0
Food	1	1	0	0	2

Preferences for Trip Type

At the end of their trips, most boaters said they prefer the mode of propulsion of the trip they took (Table 4.27). It may be important to remember that most motor passengers had previously taken both motorized and oar trips on whitewater rivers, while most oar passengers

and private boaters had not experienced motor trips firsthand. Interestingly, 28% of motor passengers said that the type of boat would not matter to them, indicating that, for this sizable minority, other factors (such as timing, speed, trip length, or safety) are probably more important than whether the trip is motorized or not. Among guides, few preferred motor trips, 59% preferred oar trips, and 37% were indifferent.

Table 4.27 Preferences for Running the River with Motorized or Oar Trips

	Motor (n=449)	Oar (n=437)	Private (n=124)	Guide (n=102)
	-----*Percent*-----			
Prefer an oar trip	10	93	99	59
Prefer a motorized trip	62	3	0	4
Makes no difference	28	4	1	37

p<.0005, Chi-square test

This question included an open-ended query about why boaters had these preferences for oar or motor trips. The comments boaters provided help clarify the preferences displayed in Table 4.27. The numbers in Table 4.28 are the number of respondents giving each answer.

Table 4.28 Reasons for Preference for Type of Trip

	Motor passengers who prefer		Oar passengers who prefer		Privates who prefer
	Motor	Oar	Motor	Oar	Oar
	-----Number of Respondents-----				
Safer/more control	89		7		
Can see canyon in less time/more efficient	58		1		
Less strenuous/easier	18		1		
Speed	17		2		
Can do more/longer side trips	17			3	1
Oars too strenuous, require fitness or skill	17				3
Allows kids, elderly, disabled	11		1		
Maneuverability	9		1		
More exciting	9	1		36	5
Oars to slow/boring	9				
Can carry more/more comfortable	8				1
Motor boats are big	6	1	1	2	4
Oar boats can flip	5		1		
More relaxed/less rushed	4			18	4
Oars can't do all rapids	3				
Better for family groups	3				
More connection with nature	2	2		27	8
Cost	2				
Trip is quieter	1	8		122	20
Guides' experience level	1			3	
Less environmental impact	1			41	8
More physically active		7		7	6
Feeling of involvement		4		18	7
Dislike motor noise		4		103	49
Dislike motor fumes		1		32	25
Slower pace/longer		4		36	15
More challenging		5		12	14
Better feel for power of the river		3		22	8
Smaller group sizes		2		7	7
Fewer people/boat				7	1
No mechanical support		1		7	2
More "natural"		3		65	10
More of a Wilderness experience		1		13	10
"Better experience"		2		7	2
Try something different		5			
Motor boats too fast				2	3
Historical connection/traditional way		1		16	1
More "elegant"				5	1
Motors should be banned				11	6
Good to kayak or paddle				8	12

About one-fifth of motor passengers said issues of safety caused them to prefer motor trips. A sizable number also enjoyed the efficiency of a motorized trip – being able to see the whole canyon (or more of it), in less time. Some also preferred these trips because they are less strenuous and allow older and younger people to participate. Oar passengers tended to prefer oar trips because they perceived them to be quieter than motor trips or because they disliked motor noise. Fifty-one percent of oar passengers (225 passengers) wrote in one of these two sentiments on the open-ended question, suggesting that this is a widespread feeling about motor trips among oar passengers. A significant number of commercial oar passengers also preferred oar trips because they felt they are more "natural," have a slower pace, have less environmental impact, or are more exciting. Interestingly, several oar passengers said they liked the feeling of historical connection they have on an oar trip. (Many of these passengers were dory trip customers.)

Private boaters' reasons for preferring oar trips were quite similar to those of commercial oar passengers – 56% made reference to the quieter trip or to a dislike of motor noise. A larger proportion of the private boaters also objected to motor fumes, and many valued the added challenge they associate with oar trips.

Most commercial passengers, on both motor and oar trips, would prefer to go with an outfitter than with a private trip, though about 25% were indifferent (Table 4.29). Private boaters, not surprisingly, were exactly the opposite, with none preferring to take commercial trips. About one-quarter of the guides would rather run the river with a commercial trip, whereas 45% would prefer to go on a private trip.

Table 4.29 Preference for Running the River with Commercial or Private Trips

	Motor (*n*=441)	Oar (*n*=428)	Private (*n*=122)	Guide (*n*=101)
	-----Percent-----			
Prefer to go with a private trip	8	18	97	45
Prefer to go with a commercial trip	65	61	0	24
Makes no difference	27	22	3	32

$p<.0005$, Chi-square test

A majority of each group would prefer to run the river with a small group (20 or less), though motor passengers were less committed to small group sizes (Table 4.30). In fact, 4% of motor passengers (but no oar passengers or private boaters) preferred large groups of 30-40 people.

Table 4.30 Preference for Running the River with Different Size Groups

	Motor (*n*=449)	Oar (*n*=436)	Private (*n*=124)	Guide (*n*=103)
	-----Percent-----			
Prefer a small group (20 persons or less)	56	81	100	66
Prefer a medium size group (20-30 persons)	27	17	0	22
Prefer a large group (30-40 persons)	4	0	0	2
Makes no difference	13	2	0	10

$p<.0005$, Chi-square test

Preference for group size was related to the size of one's own group, though the majority of all respondents generally preferred small groups (Table 4.31). Among those on trips with 20 or fewer passengers, 87% preferred small groups, 11% preferred groups of 20-30, and none preferred to be with large groups. Among those in large groups, only 48% preferred to be with

small groups. However, very few of even these respondents would prefer to be with large parties.

Table 4.31 Preference for Running the River with Different Size Groups, by Own Group Size

	Own Group Size		
	10-20	21-30	31-40
	-----Percent-----		
Prefer a small group (20 persons or less)	87	60	48
Prefer a medium size group (20-30 persons)	11	32	35
Prefer a large group (30-40 persons)	0	2	6
Makes no difference	3	9	11

$p<.0005$, Chi-square test

Conditions and Features Influencing Experience Quality

Several questions asked about overall trip quality and the specific experiences or benefits boaters derived from their trips. Other questions asked about environmental conditions and features boaters might have noticed, and how these affected experience quality.

Overall Evaluation of Trip Quality

Overall, most boaters rated their trip as excellent or perfect (Table 4.32 and Figure 4.10), and groups did not differ significantly in this evaluation. When asked if they would come back if they could, most (60% of commercial and 90% of private boaters) said yes (Figure 4.11).

Table 4.32 Overall Rating of River Trip and Desire to Return

	Motor (n=464)	Oar (n=442)	Private (n=112)	p^1
Rating (5-point scale)	4.30	4.30	4.17	.16
Would return if possible (7-point scale)	6.1[a]	6.1[a]	6.8[b]	.000

[1] ANOVA. Numbers with different superscripts within each row are different at α=.05.

Figure 4.10 Rating of Trip

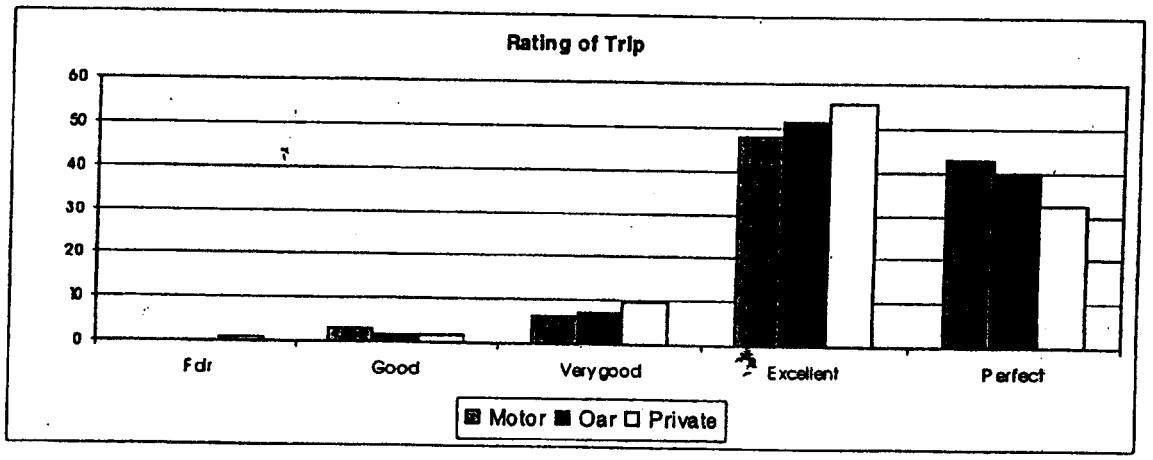
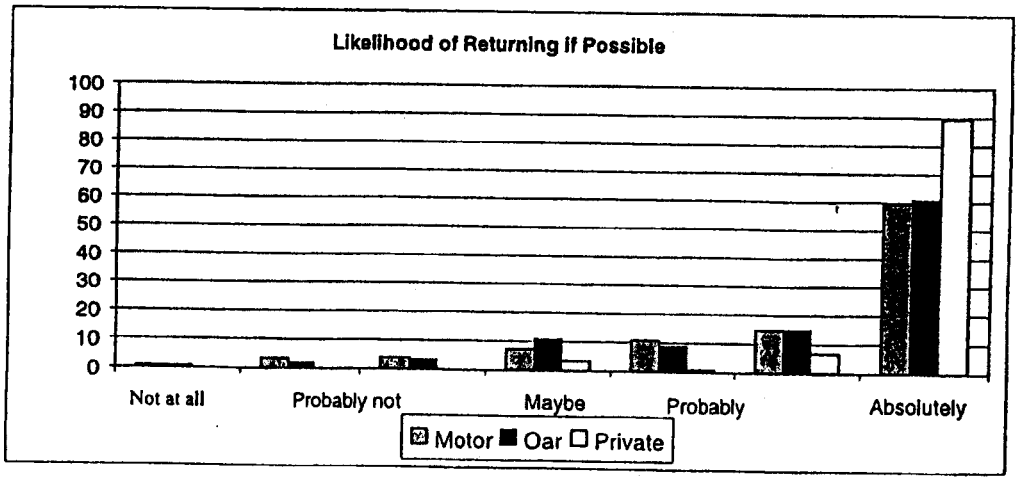


Figure 4.11 Likelihood of Floating the Grand Canyon Again if Possible



Trip Circumstances

Several items asked respondents to comment on the pace of the trip (Table 4.33), opportunities for hiking (Table 4.34), and weather (Table 4.35). The following tables provide mean values (on the 4-point scale, from +2 to –2) and the percent who agreed (slightly or strongly) with each statement in parentheses. All three groups felt that they "floated quietly on the river" and traveled at a leisurely pace, and none wished the trip had been shorter. Motor passengers were most likely to agree that the pace was leisurely, and to disagree that the trip was too fast (only 10% agreed) or too short (only 29% agreed). Oar passengers were very similar to motor passengers in their evaluations of trip pace: only 35% of these respondents said the trip was too short and 16% wished the trip had been shorter. Private boaters were less likely to say their trip was leisurely than commercial passengers, though they too felt the trip was leisurely overall. Just over 50% of private boaters felt that their trip had been too short.

Table 4.33 Evaluation of Pace of Trip[1]

	Motor (n=464)	Oar (n=442)	Private (n=112)	Guides (n=102)	p^2
Overall, I wish the trip had been shorter	-1.21 (17)	-1.22 (16)	-1.42 (12)	n.a.	.20
Our trip traveled at a leisurely pace	1.43[a] (95)	1.38[ab] (94)	1.13[bc] (90)	1.02[c] (82)	.001
Overall, I felt the trip was too short	-0.57[a] (29)	-0.40[a] (35)	0.11[b] (51)	n.a.	.000
On our trip, we floated quietly on the river	0.81[a] (77)	1.01[a] (85)	1.38[b] (96)	n.a.	.000
Our trip traveled too fast	-1.27[a] (10)	-1.22[a] (9)	-0.76[b] (23)	-0.90[b] (24)	.000

[1] 4-point scale: +2 (strongly agree), +1 (probably agree), -1 (probably disagree), -2 (strongly disagree). Mean values, with percent agreeing in parentheses.
[2] ANOVA. Numbers with different superscripts within each row are different at α=.05.

All respondents agreed equally that they were encouraged to get off the boat to see the Canyon (Table 4.34). Nearly all felt they had plenty of time for hiking and exploring, though there were significant differences among the groups: 52% of motor passengers, 47% of oar passengers, and 35% of private boaters strongly agreed with this statement (15% of private boaters disagreed). At the same time, private boaters disagreed most strongly that they "mostly sat on the boat rather than taking side trips." Private boaters made more such excursions, yet many still felt they would have enjoyed additional opportunities.

Table 4.34 Evaluation of Opportunities to Hike and Explore[1]

	Motor (n=464)	Oar (n=442)	Private (n=112)	p^2
On our trip we had plenty of time for hiking and exploring	1.34[a] (91)	1.22[a] (88)	0.90[b] (85)	.001
On our trip we mostly sat on the boat rather than taking site trips	-1.02[a] (21)	-1.10[a] (19)	-1.36[b] (11)	.02
We were encouraged to get off the boat to see the Canyon	1.55 (94)	1.62 (96)	1.59 (96)	.36

[1]4-point scale: +2 (strongly agree), +1 (probably agree), -1 (probably disagree), -2 (strongly disagree). Mean values, with percent agreeing in parentheses.
[2]ANOVA. Numbers with different superscripts within each row are different at α=.05.

There were no differences among the groups in their description and evaluation of the weather (Table 4.35). Only about one-third of each group agreed it was often too hot or too cold, and 15-20% said it rained a lot. Most did not feel that weather made them uncomfortable "much of the time."

Commercial passengers agreed that it "was always easy to ask the boatmen questions about the Canyon" and that they "particularly enjoyed this trip because the boatmen were friendly and interesting" (Table 4.36). Only 4% disagreed with the first statement and 2% with the second statement.

Table 4.35 Evaluation of Weather[1]

	Motor (n=465)	Oar (n=449)	Private (n=124)	p^2
The weather was often too hot or too cold	-0.39 (37)	-0.59 (31)	-0.52 (33)	.09
It rained a lot during our trip	-1.23 (14)	-1.19 (17)	-1.15 (18)	.78
The weather made me uncomfortable much of the time	-1.00 (21)	-1.12 (14)	-1.12 (15)	.22
It was cloudy a great deal of the time	-1.26 (13)	-1.22 (16)	-1.36 (12)	.49

[1]4-point scale: +2 (strongly agree), +1 (probably agree), -1 (probably disagree), -2 (strongly disagree). Mean values, with percent agreeing in parentheses.
[2]ANOVA.

Table 4.36 Evaluation of Interaction with Commercial Guides[1]

	Motor (n=465)	Oar (n=449)	p^2
It was always easy to ask the boatmen questions	1.80 (96)	1.80 (97)	.91
I particularly enjoyed the trip because the boatmen were friendly	1.76 (98)	1.74 (99)	.57

[1]4-point scale: +2 (strongly agree), +1 (probably agree), -1 (probably disagree), -2 (strongly disagree). Mean values, with percent agreeing in parentheses.
[2]T-Test

Four questions asked boaters to evaluate the level of development and facilities along the river. Although all groups disagreed that more developments like Phantom Ranch should be built along the river, private boaters felt most strongly and motor passengers least strongly (Table 4.37). Ten percent of motor passengers, 7% of oar passengers, and 4% of private boaters agreed with this statement. Similarly, most respondents strongly opposed the notion of building "an aerial tram into the canyon so more people could enjoy it," but 9% of motor passengers, 6% of oar passengers, and 5% of private boaters agreed with the idea. About 10-15% of both commercial groups "would have preferred to have more of the conveniences of home," compared

to 2% of private boaters. Seventy-nine percent of private boaters strongly disagreed with this statement (compared to 52% of motor passengers and 58% of oar passengers). Twelve percent of motor passengers, 11% of oar passengers, and 9% of private boaters would have enjoyed the trip more if they had had better camping facilities, but about 55% of each group strongly disagreed with this statement. It appears that most boaters are pleased with the the current level of development in the canyon.

Table 4.37 Evaluation of Level of Development and Facilities[1]

	Motor (n=465)	Oar (n=449)	Private (n=124)	p^2
They should build an aerial tramway into the canyon so more people could enjoy it	-1.60 (9)	-1.70 (6)	-1.74 (5)	.15
More developments like Phantom Ranch should be build along the river	-1.46[a] (10)	-1.58[ab] (7)	-1.79 (4)	.002
I would have preferred to have more of the conveniences of home	-1.16[a] (15)	-1.3a (12)	-1.74 (2)	.000
I would have enjoyed the trip more if we had had better camping facilities	-1.26 (12)	-1.29 (11)	-1.50 (9)	.07

[1]4-point scale: +2 (strongly agree), +1 (probably agree), -1 (probably disagree), -2 (strongly disagree). Mean values, with percent agreeing in parentheses.
[2]ANOVA. Numbers with different superscripts within each row are different at α=.05.

Personal Benefits

All boaters reported many personal benefits and positive experiences during their trips, but there were some differences among groups. In one question, boaters were asked about how often they experienced five conditions, using a 5-point scale from "never" to "often." Private boaters felt more rushed than commercial passengers (Table 4.38). Whereas 48% of commercial motor and 35% of commercial oar passengers said they never felt rushed (circling "1" on the 5-point scale), only 18% of private boaters indicated never feeling rushed. This may reflect the

need for all members in these smaller, private groups to participate in chores, as well as the generally longer amount of time that private boaters spend on the water each day. It also may reflect that oar trips and especially private trips spend more time hiking, and wish they could do even more. It is interesting that the commercial oar trips, which were longer and slower than motor trips, also had passengers who felt slightly more rushed. Perhaps motor trips' ability to cover miles rapidly allowed passengers on those trips to take more time loading, unloading, and relaxing.

Motor passengers were significantly less likely to report that they "enjoyed hearing natural sounds," though the differences seem slight. That is, approximately 60% of oar passengers and private boaters indicated that they "often" enjoyed hearing natural sounds (circling "5" on the 5-point scale), compared to 51% of motor passengers. Commercial oar passengers on average were significantly more likely to say they "felt relaxed," though these differences were also slight. There were no significant differences among the groups in how often they experienced a sense of solitude: 85% of private boaters and about 73% of commercial boaters said they frequently or often felt solitude (4 or 5 on the 5-point scale).

Table 4.38 Frequency of Experiences During River Trip[1]

Mean rating[1]	Motor (n=278)	Oar (n=309)	Private (n=116)	p^2
I felt rushed	1.99[a]	2.15[a]	2.67[b]	.000
I enjoyed hearing natural sounds	4.32[a]	4.54[b]	4.55[b]	.000
We camped within sight or sound of another river trip	1.51[a]	1.74[b]	2.27[c]	.000
I felt relaxed	4.55	4.67	4.54	.012
I experienced a sense of solitude	3.91	3.90	4.03	.391

[1]5-point scale: 1 = never; 3 = seldom; 5 = often
[2]ANOVA. Numbers with different superscripts within each row are different at α=.05.

One might ask whether the experiences in Table 4.38 differed by trip length or number of passengers. No differences were found for feeling relaxed or experiencing a sense of solitude, either by one's own group size or by the number of nights one spent on the river. Interestingly, those on longer trips were significantly more likely to feel rushed than those on shorter trips.

Commercial motor passengers rarely camped near others, whereas private boaters were somewhat more likely to say they camped near others more frequently. These results are consistent with observer data (presented in Chapter 3). Commercial oar passengers were intermediate in their answers to this item.

A number of other statements included from the 1976 study asked about additional feelings and benefits boaters may have experienced. Like earlier questions, these asked respondents to indicate agreement or disagreement on a 4-point scale. Most boaters felt closer to nature, believed the Grand Canyon experience can't be found anywhere else, and felt that they benefited from exposure to the elements (Table 4.39). They agreed, but less strongly, that they had experienced new feelings, learned things about themselves, and felt that the experience was personally challenging. There were no differences among the three groups for these items. However, there were significant difference for other items, most of which related to expectations. Whereas motor and oar passengers tended to agree that they hadn't expected the canyon itself to be so overwhelming, private boaters on average disagreed, possibly because this group had significantly more experience boating in the Grand Canyon. All groups disagreed that they "hadn't expected the rapids to be so powerful" and that they "didn't have a very clear idea of what a trip through the canyon would be like," but private boaters disagreed slightly more. (About 45% of commercial passengers but only 15% of private boaters said they didn't have a clear idea.) Again, this may have to do with private boaters' greater levels of experience and

exposure to the canyon. Finally, private boaters were significantly more likely to say their physical condition improved (88% agreed, compared to 72% of commercial passengers). This probably has to do with the exercise provided by rowing and the more frequent and longer hikes taken on some private trips.

Table 4.39 Personal Benefits Obtained[1]

	Motor (n=457)	Oar (n=442)	Private (n=124)	p^2
The Grand Canyon experience can't be found anywhere else	1.53 (91)	1.56 (93)	1.50 (90)	.80
I felt closer to nature	1.52 (96)	1.57 (97)	1.42 (96)	.13
I gained some degree of communion with nature	1.21 (91)	1.27 (94)	1.30 (92)	.44
I benefited from exposure to the elements	1.16 (90)	1.15 (88)	1.37 (96)	.057
The experience was personally challenging	0.82 (78)	0.87 (80)	1.04 (86)	.162
I experienced new feelings	0.72 (75)	0.62 (72)	0.66 (75)	.49
My physical condition improved	0.58[a] (71)	0.66[a] (73)	1.08[b] (88)	.000
I learned things about myself	0.48 (68)	0.46 (68)	0.74 (78)	.068
I didn't expect the Canyon itself to be so overwhelming	0.29[a] (59)	0.16[a] (55)	-0.55[b] (32)	.000
I really didn't have a very clear idea of what a trip through the Canyon would be like	-0.16[a] (47)	-0.28[a] (42)	-1.32[b] (15)	.000
I didn't expect the rapids to be so powerful	-0.53[a] (32)	-0.71[a] (25)	-1.08[b] (12)	.000

[1]4-point scale: +2 (strongly agree), +1 (probably agree), -1 (probably disagree), -2 (strongly disagree). Mean values, with percent agreeing in parentheses.
[2]ANOVA. Numbers with different superscripts within each row are different at α=.05.

More than 75% of all respondents said they learned new information about geology, rivers, and whitewater rafting, and more than 75% of commercial passengers also agreed they learned something new about ecology and nature in general (Table 4.40). For each of these

items, commercial passengers on average felt they learned more than private boaters. This may be due in part to higher a priori knowledge among private boaters and/or to efforts by commercial guides to share information with their passengers. However, private boaters were significantly more likely to say they acquired new skills.

Table 4.40 Learning Benefits Obtained[1]

	Motor (n=457)	Oar (n=442)	Private (n=124)	p^2
I learned a great deal of new information about				
Whitewater rafting	1.53[a] (95)	1.38[a] (93)	0.97[b] (83)	.000
Geology	1.40[a] (95)	1.37[a] (94)	0.98[b] (85)	.000
Rivers	1.22[a] (90)	1.22[a] (89)	0.77[b] (77)	.000
Nature in general	1.07[a] (86)	1.03[a] (86)	0.62[b] (73)	.000
Ecology	1.03[a] (85)	0.89[a] (80)	0.52[b] (69)	.000
I acquired new skills	0.66[a] (73)	0.86[ab] (88)	0.93[b] (84)	.012

[1]4-point scale: +2 (strongly agree), +1 (probably agree), -1 (probably disagree), -2 (strongly disagree). Mean values, with percent agreeing in parentheses.
[2]ANOVA. Numbers with different superscripts within each row are different at α=.05.

Many respondents said their trip gave them a greater appreciation for the value of wild places and made them more likely to pay attention to environmental issues (Table 4.41). Significantly more private boaters said they were likely to join environmental organizations, donate money, or volunteer as a result of their trip.

Table 4.41 Self-Assessment of the Effect of the River Trip on Environmental Awareness

	Motor (n=457)	Oar (n=442)	Private (n=124)	p[1]
	-----Percent Agreeing-----			
I am more likely to pay attention to environmental problems in my community	56	59	57	.71
I have an increased appreciation for the value of wild places	75	76	79	.61
I am more likely to join an outdoor activities club or organization	23	30	34	.02
I am more likely to donate money to environmental or conservation organizations	37	48	52	.001
I am more likely to volunteer to work for an environmental or conservation organization	25	30	38	.005
I am more aware of the need to protect special places	80	84	85	.23

[1]Chi-Square test

Interaction with other members of one's trip is an important influence on experience quality. Most respondents agreed that they "particularly enjoyed this trip because the people were friendly and interesting" and that they "often had relaxed conversations while on the river" (Table 4.42). Private boaters were significantly more likely to agree that the "people in our party were very important to me," probably because private trips are more likely to be made up of individuals who know each other beforehand. Three-quarters of private boaters, 53% of commercial oar passengers, and 39% of commercial motor passengers said that after the trip they expected to get together with people they had met on the trip.

Table 4.42 Socialization Within the Group[1]

	Motor (n=457)	Oar (n=442)	Private (n=124)	p^2
We often had relaxed conversations while we were on the river	1.64 (97)	1.75 (98)	1.64 (96)	.017
The people in our party were very important to me	0.98[a] (81)	1.02[a] (84)	1.46[b] (95)	.000
The trip provided me an opportunity to share my experiences with others more than I usually do	0.44 (67)	0.56 (71)	0.64 (73)	.18
I particularly enjoyed this trip because the people were friendly and interesting	1.43 (94)	1.44 (95)	1.32 (94)	.35
After we get off the river, I expect to meet with new friends made on this trip	-0.29[a] (39)	0.07[b] (53)	0.76[c] (77)	.000
After we get off the river, I expect to write to new friends made on this trip	-0.32[a] (41)	0.15[b] (56)	0.19[b] (58)	.000

[1] 4-point scale: +2 (strongly agree), +1 (probably agree), -1 (probably disagree), -2 (strongly disagree). Mean values, with percent agreeing in parentheses.
[2] ANOVA. Numbers with different superscripts within each row are different at α=.05.

Comparison with Expectations

There were a number of differences between commercial and private boaters in how aspects of trips met with expectations (Table 4.43), but commercial oar and motor passengers were almost identical. The primary differences between private and commercial boaters occurred because private boaters were more likely to say that conditions were "as expected" and commercial boaters were more likely to say conditions were "better than expected." One exception was for solitude: 33-43% of each group said the sense of solitude was better than expected, and the groups did not differ. The other was noise: 38% of private boaters said this was worse than expected, and 25% said it was better than expected. In contrast, only about 10% of commercial passengers said noise was worse than expected, while 60-70% said it was better. More than 70% of commercial passengers (both motor and oar) said the trip exceeded their expectations for the quality of the food, the cleanliness of campsites, the excitement of the

whitewater, their guides' knowledge and skill, the feeling of naturalness, and the sense of remoteness. Private boaters, being more experienced, probably had a better idea beforehand of what the Grand Canyon was like.

Table 4.43 Comparisons of Trip with Expectations[1]

	Motor (n=465)	Oar (n=445)	Private (n=123)	p^2
Guides' knowledge about natural resources	1.57	1.50	n.a.	
Skill of boatmen	1.47[a]	1.43[a]	0.80[b]	.000
Cleanliness of campsites	1.42[a]	1.41[a]	0.59[b]	.000
Quality of the food	1.38[a]	1.42[a]	0.90[b]	.000
Excitement of the whitewater	1.22[a]	1.10[a]	0.83[b]	.000
Sense of remoteness from civilization	1.22[a]	1.09[a]	0.41[b]	.000
Feeling of naturalness	1.21[a]	1.16[a]	0.49[b]	.000
Level of human-caused noise in the Canyon	1.11[a]	0.77[b]	-0.15[c]	.000
Opportunities for solitude	0.45[a]	0.41[a]	0.25[a]	.10
Sounds of nature	0.95[a]	0.91[a]	0.51[b]	.000

[1] 5-point Scale: +2 (better than expected), 0 (as expected), to –2 (worse than expected).
[2] ANOVA. Numbers with different superscripts within each row are different at α=.05.

Perception of Environmental Impacts in the Canyon

Boaters were asked five questions about the severity of environmental impacts they might have observed, using a 4-point scale. None of four specific environmental impacts was evaluated as a serious issue by commercial passengers (Table 4.44 and Figure 4.12), and 70-80% of these boaters agree that the "Grand Canyon environment is not being damaged by overuse." Private boaters displayed more concern about possible environmental impacts, but even this group did not express a majority opinion that litter, trampling of vegetation, or overuse of campsites was a problem. However, 67% said that overuse of attraction sites was a problem, and 58% said the

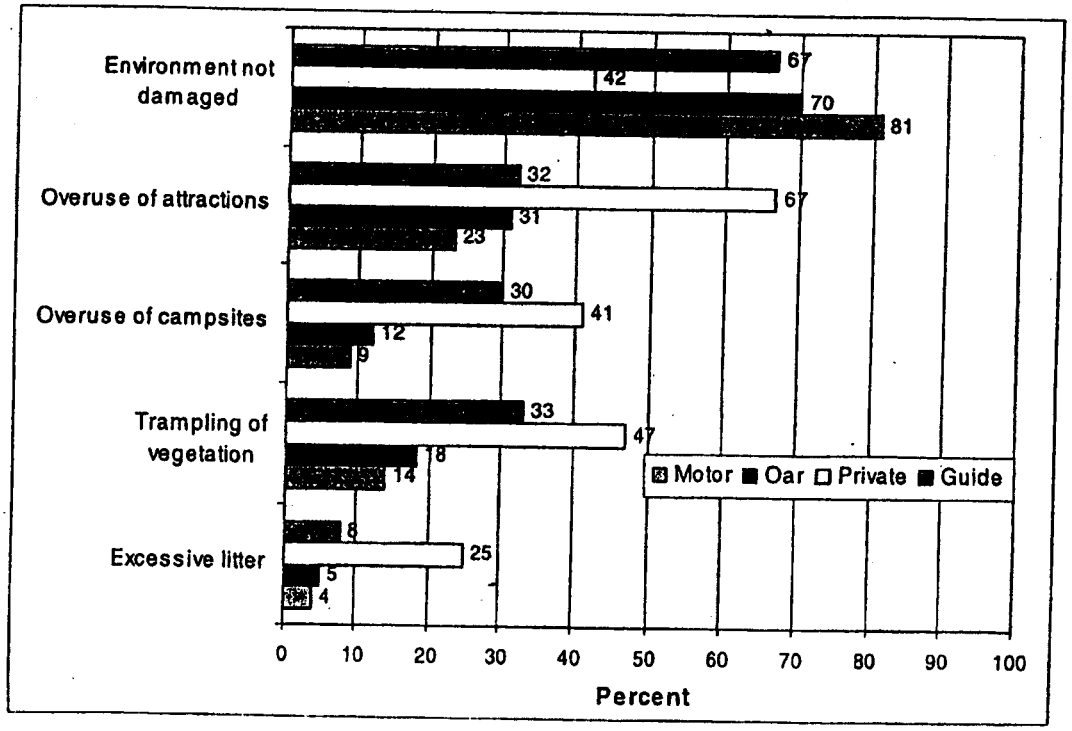
Grand Canyon environment is being damaged by overuse. Thus, private boaters are either more observant of environmental conditions or, more likely, more sensitive to them.

Table 4.44 Perception of Environmental Impacts[1]

	Motor (n=460)	Oar (n=441)	Private (n=123)	Guides (n=104)	p
Excessive litter exists in the GC	-1.73[a]	-1.63[a]	-.81[b]	-1.48[b]	.000
Trampling of natural vegetation exists in the GC	-1.21[a]	-1.01[a]	-.03[b]	-.59[b]	.000
Overuse of campsites exists in the GC	-1.36[a]	-1.14[a]	-.20[b]	-.67[b]	.000
Overuse of visitor attraction sites exists in the GC	-.87[a]	-.57[b]	.49[c]	-.41[b]	.000
The GC environment is not being damaged by overuse	.99	.57	-.23	.44[b]	.000

[1]Mean values on 4-point scale: +2 (strongly agree), +1 (probably agree), -1 (probably disagree), -2 (strongly disagree).
[2]ANOVA. Numbers with different superscripts within each row are different at α=.05.

Figure 4.12 Percent Agreeing with Statements about Environmental Impacts in Grand Canyon



Another set of questions asked boaters if they were aware of various conditions, events, or features during their trip. Those who indicated awareness were asked whether the conditions, events, or features added to or detracted from their experience, using a 7-point scale.

Nearly all boaters noticed the rapids, the quality of the food, wildlife, stopping at attraction sites, having opportunities to learn about the canyon from knowledgeable sources, the presence of oar trips, and the presence of motor trips (Table 4.45). For other items, especially the developments at Phantom Ranch, the presence of hikers, overflights, and the behavior of other groups, private boaters were more likely to notice.

Table 4.45 Percent of Boaters Who Noticed of Conditions and Features of the Canyon

	Motor (n=459)	Oar (n=444)	Private (n=124)	p[1]
Rapids and whitewater	100	100	100	na[2]
The quality of the food	100	99	97	na[2]
Opportunities to learn about the Canyon	100	99	90	.000
Wildlife	98	99	100	na[2]
Stopping at attraction sites like Deer Creek or the LCR	93	94	99	.032
Seeing motor-powered watercraft	91	87	90	.129
Seeing oar-powered watercraft	91	96	100	.000
Seeing hikers along the shore	81	78	91	.004
Bridges and buildings at Phantom Ranch	79	75	98	.000
The behavior of other groups you saw	79	88	94	.000
Scenic overflights	64	82	95	.000
Changing people in your group partway through the trip	44	41	54	.036
Hiking into or out of the canyon to meet or leave a trip	42	59	30	.000

[1]Chi-square test
[2]50% of expected cell counts were less than 5; test of significance not possible

Table 4.46 Mean Evaluation[1] of the Effect of Conditions, Events, or Features on Experience, for Those Who Noticed

	Motor	Oar	Private	p^2
Rapids and whitewater	2.92[a]	2.91[a]	2.90[a]	.807
Stopping at attraction sites like Deer Creek or the LCR	2.67[a]	2.59[a]	2.59[a]	.37
Opportunities to learn about the Canyon	2.56[a]	2.63[a]	1.98[b]	.000
The quality of the food	2.38[a]	2.39[a]	1.84[b]	.000
Wildlife	2.38[a]	2.42[a]	2.51[a]	.326
Hiking into or out of the canyon to meet or leave a trip	1.06[a]	1.52[a]	0.40[b]	.000
Seeing oar-powered watercraft	0.65[a]	1.00[b]	0.57[a]	.000
Scenic overflights	0.49[a]	-0.77[b]	-2.05[c]	.000
Seeing hikers along the shore	0.46[a]	0.28[a b]	0.16[b]	.013
Changing people in your group partway through the trip	0.27[a]	0.49[a]	0.38[a]	.43
Bridges and buildings at Phantom Ranch	0.25[a]	-0.13[b]	-0.07[a b]	.001
The behavior of other groups you saw	0.22[a]	-0.17[b]	-0.57[c]	.000
Seeing motor-powered watercraft	0.12[a]	-1.39[b]	-1.68[b]	.000

[1] 7-point Scale: +3 (added a lot) to -3 (detracted a lot)
[2] ANOVA. Numbers with different superscripts within each row are different at α=.05.

Among those who noticed each condition, the groups did not differ in reaction to rapids/whitewater, wildlife, or stopping at attraction sites, all of which were rated as uniformly and highly positive (Table 4.46). There was also no difference in reaction to changing people in the group partway through the trip, which was evaluated as neutral to slightly positive. Where differences did emerge, they were quite significant. In general, those private boaters who noticed conditions evaluated "problems" as more serious than commercial passengers who noticed them, and oar passengers were intermediate between motor and private boaters. For example, 37% of private, 33% of oar, and 19% of motor boaters evaluated the developments at Phantom Ranch negatively. Three-quarters of private boaters, 72% of oar passengers, but only 11% of motor

passengers evaluated encounters with motor trips negatively. Similar results were found for reactions to overflights and the behavior of other groups.

Comparison of the Colorado to Other Rivers

Motor, oar, and private boaters agreed that the Colorado River in the Grand Canyon is better than other rivers they have run in its scenic views (94-96% agree), sense of challenge (84-92% agree), quality of the whitewater (86-90% agree), length of time one can travel through an undisturbed environment (88-92% agree), geological formations (96-99% agree), and ability to have a life-changing experience (67-71% agree) (Table 4.47 and Figure 4.13). The three best qualities (based on average ratings) were the same for all three groups. However, the groups differed in their evaluations of other experience qualities. More than 80% of motor and oar passengers felt that the Colorado River in the Grand Canyon excels over other rivers in the sense of freedom and ability to explore. Private boaters agreed, but less strongly, with these assessments: 15% of private boaters said the Colorado River is worse than other rivers in the sense of freedom one has, while 69% said it is better.

The primary differences among the groups for this question related to evaluations of solitude, level of naturalness, and peace and quiet. While about 70% of the two commercial groups said opportunities for solitude are greater in the Grand Canyon than on other rivers, only 53% of private boaters agreed. Twenty-two percent of the private boaters thought other rivers are better, compared to only 6 or 7% of commercial boaters. The findings are almost identical for evaluation of peace and quiet: 57% of private boaters, 76% of motor passengers, and 82% of oar passengers said the Grand Canyon is better, but 17% of private, and 5% of commercial boaters

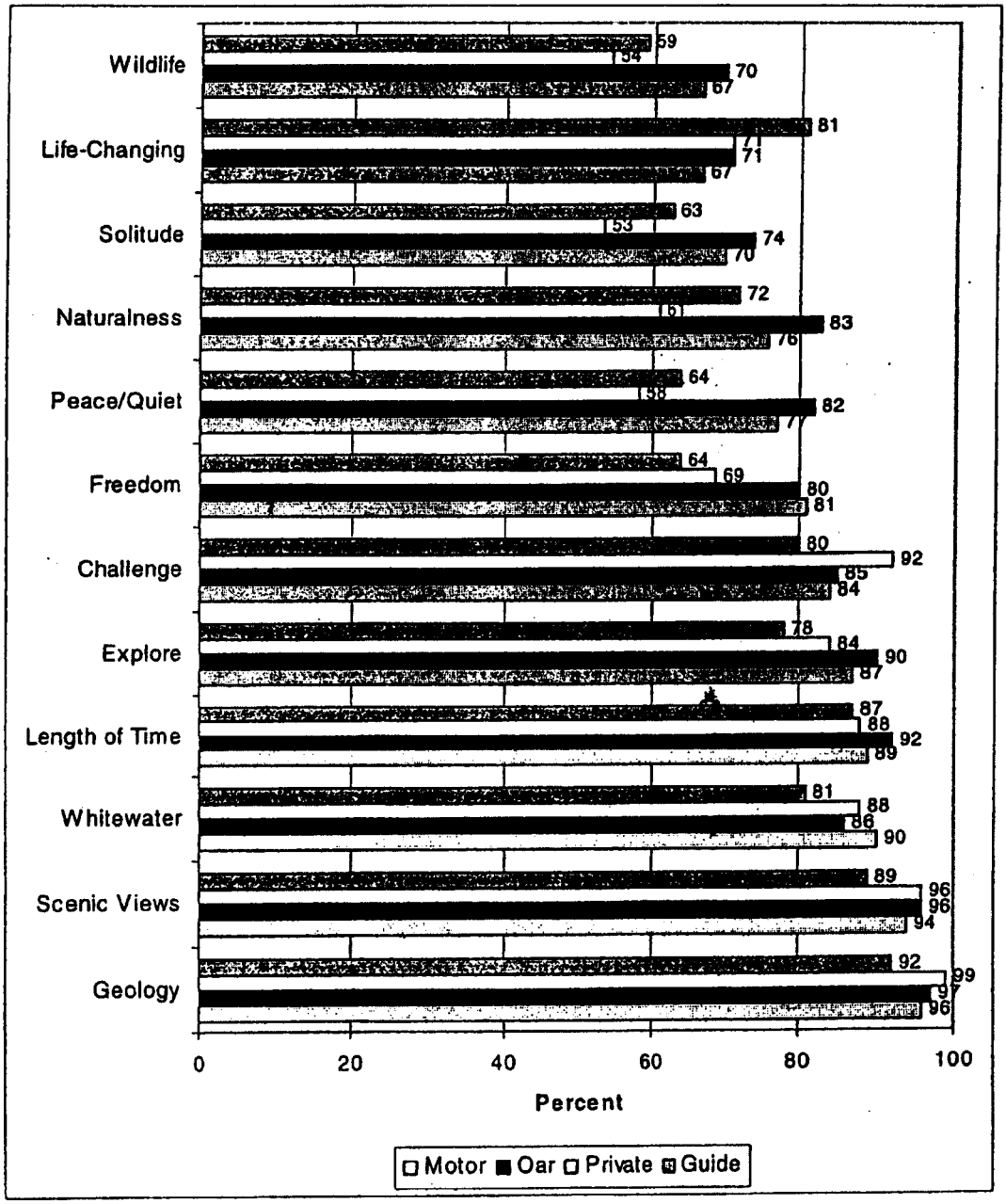
said it is worse than other rivers. For "level of naturalness," 61% of private, but 76% of motor and 83% of oar passengers said the Colorado River is better, while 22% of private, 3% of motor, and 5% of oar passengers said it is worse. Private boaters – again, because they have more experience – may be more likely to have been on "wilderness" rivers before, in the sense of rivers that offer more quiet and solitude. Despite these differences among groups, it is important to remember than, on average, all boaters evaluated the Colorado River in the Grand Canyon as better than other rivers for each of the 12 items (Figure 4.13).

Table 4.47 Comparison of the Colorado River in the Grand Canyon to Trips on Other Whitewater Rivers[1]

	Motor (n=278)	Oar (n=309)	Private (n=116)	Guides (n=102)	p^2
Geological formations	2.71	2.77	2.72	2.59	.22
Scenic views	2.62 [ab]	2.69 [a]	2.56 [ab]	2.38 [b]	.02
Length of time you can travel through an undisturbed environment	2.39	2.41	2.29	2.20	.42
Quality of the whitewater	2.37	2.16	2.17	2.04	.09
Ability to explore	2.24 [a]	2.37 [a]	1.84 [b]	2.01 [ab]	.000
Sense of challenge	2.12	2.15	2.22	1.94	.43
Sense of freedom	2.03 [a]	2.05 [a]	1.34 [b]	1.45 [b]	.000
Level of naturalness	1.97 [a]	2.08 [a]	1.03 [c]	1.50 [b]	.000
Peace and quiet	1.82 [a]	2.00 [a]	0.89 [b]	1.31 [b]	.000
Opportunities to experience solitude	1.55 [a]	1.67 [a]	0.78 [b]	1.35 [a]	.000
Ability to have a life-changing experience	1.54 [a]	1.68 [a]	1.66 [a]	2.16 [b]	.002
Opportunities to see wildlife	1.31 [a]	1.41 [a]	0.67 [b]	1.08 [ab]	.000

[1] 7-point scale: +3 (better than other rivers), 0 (same as other rivers), -3 (worse than other rivers)
[2] ANOVA. Numbers with different superscripts within each row are different at α=.05.

Figure 4.13 Percent Evaluating Colorado River in Grand Canyon As Better Than Other Rivers



Social Conditions: Encounters, Crowding, and Conflict

Because encounters and crowding are significant management concerns, we asked several questions related to these issues. We hoped to understand how many encounters boaters recalled having, their evaluation of the effects of those encounters, their preferences and tolerances for numbers of encounters, and their views on different types of encounters, including motor vs. oar and private vs. commercial.

Expectations and Preferences for Encounters

Many survey items were intended to help explore the nature and effect of interactions among groups on boaters' experiences. The effect of encounters depends on one's personal expectations and preferences. Thus, the survey included items about expectations, preferences, and subjective assessments of how encounters compared to expectations. A large proportion of commercial passengers said they did not know how many encounters to expect to have in a day on the river (Table 4.48). More private boaters had formulated expectations, though 21% of even this group said they hadn't known what to expect. Very few visitors expected to encounter no one, but about one-quarter of commercial passengers and 44% of private boaters expected to encounter 2-3 groups per day. Twenty-six percent of motor passengers, 14% of oar passengers, and 24% of private boaters expected to have four or more encounters per day. Recall that, on average, on the busiest day they said they saw between 4 and 7 other groups, and on the slowest day about 1. Thus, recalled encounters were reasonably close to, though slightly higher than, expectations.

Table 4.48 Expectations for Daily Encounters

Expected Number of Encounters	Motor (n=461)	Oar (n=444)	Private (n=123)
	-----*Percent*-----		
0	4	4	2
1	5	11	10
2	12	12	21
3	10	10	23
4	7	5	10
5	8	5	4
6-10	8	3	8
11-20	3	1	2
Don't know	44	49	21

p<.0005, Chi-square test

Another question asked about expectations in a different way, without asking for specific numerical expectations. In this question, about one-quarter of commercial and one-third of private boaters said they had expected to see "fewer other trips than they actually saw," while about 20% said they had "expected to see more than they did" (Table 4.49). Only 27% of commercial and 42% of private boaters felt that conditions matched their expectations. These findings are consistent with the assessment based on comparing the number of recalled encounters to expected numbers: encounters were slightly higher than the number expected.

Table 4.49 Subjective Assessment of the Number of Encounters Compared to Expectations

	Motor (n=461)	Oar (n=444)	Private (n=123)
	-----*Percent*-----		
Expected to see fewer than did	26	24	34
Saw about what I expected	27	27	42
Expected to see more than I did	23	19	16
Didn't know what to expect	25	30	8

p<.0005, Chi-square test

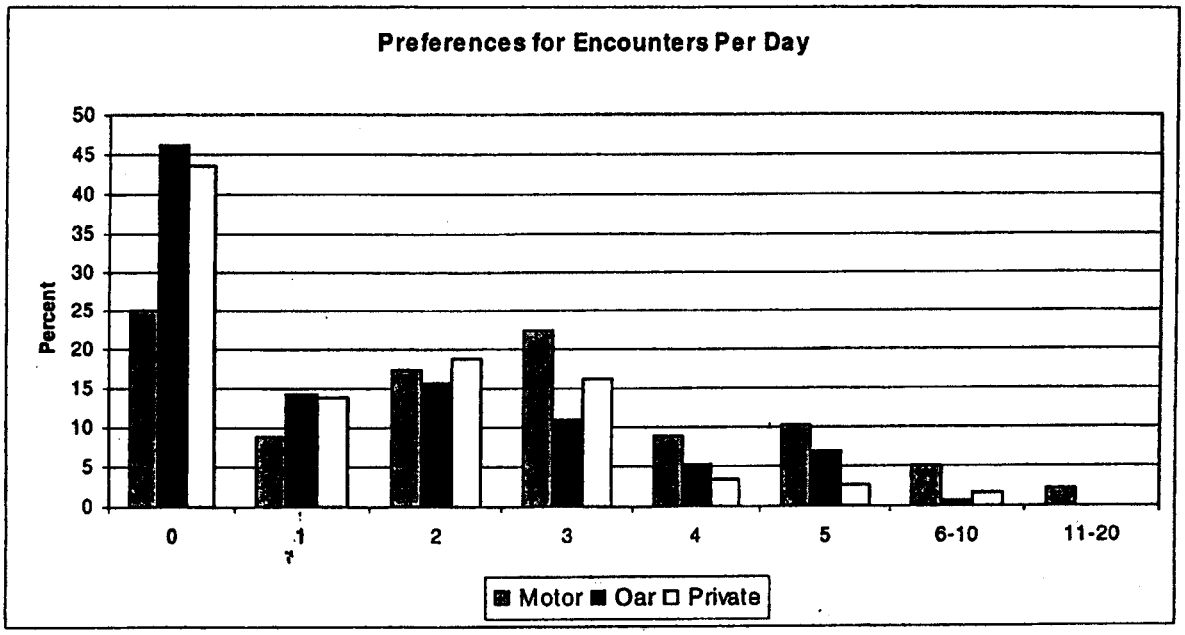
When asked about preferences, rather than expectations, about 45% of oar passengers and private boaters said they prefer to have no encounters at all, compared to 25% of motor passengers (Table 4.50 and Figure 4.14). For many motor passengers meeting other trips was part of the experience. In fact, almost 40% preferred to meet 2-3 other groups, and about one-quarter preferred to meet four or more other groups. This may relate to concerns about safety, desires to swap stories or watch others at rapids, or ability to exchange information or barter for food or ice. However, almost no boaters preferred to meet more than five other groups in a day. Thus, the window of personal preferences for encounters was quite narrow.

Table 4.50 Preferences for Encounters Per Day

Preferred Number of Other Parties Seen Per Day	Motor (n=416)	Oar (n=419)	Private (n=117)	Guide (n=95)
	-----*Percent*-----			
None	25	46	44	36
1	9	14	14	14
2	17	16	19	18
3	22	11	16	13
4	9	5	3	10
5	10	7	3	7
6-10	5	1	2	2
11-20	2	0	0	1

p<.0005, Chi-square test

Figure 4.14 Preferences for Number of Encounters Per Day



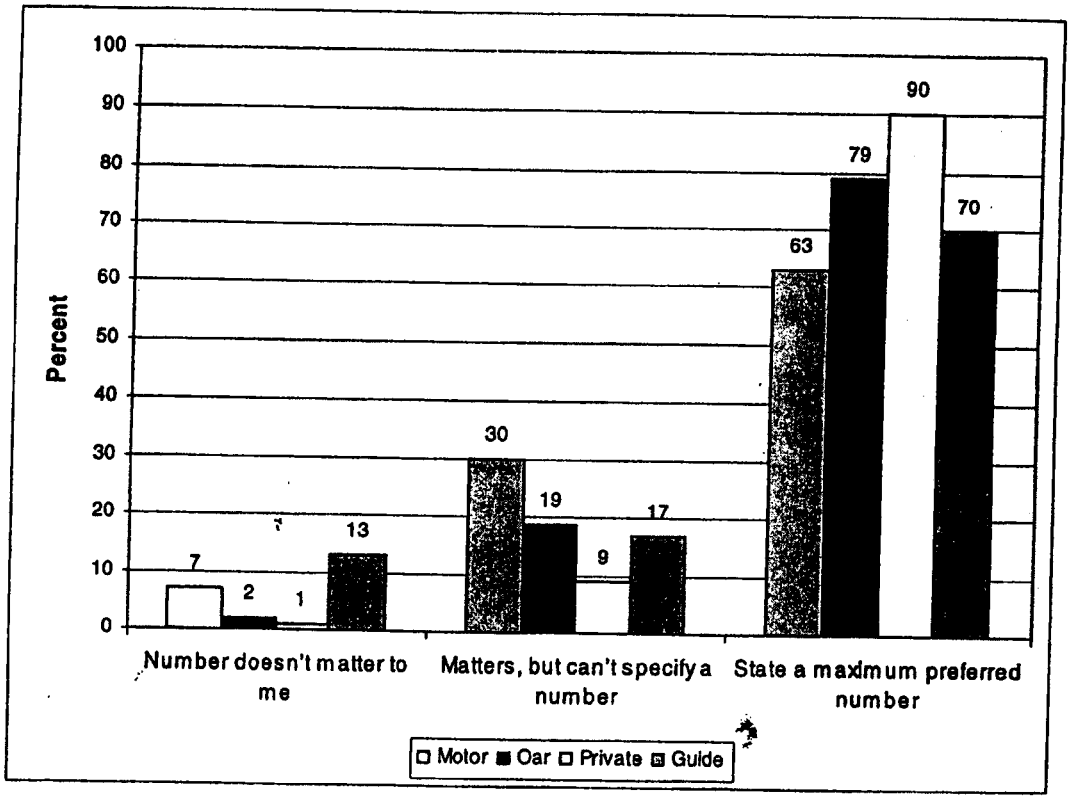
As is typically the case, most boaters had a personal preference for the maximum number of other groups that camp within sight or sound of them (Figure 4.15), and this number was usually zero (Table 4.51). (This question allowed boaters to indicate that the number of groups camped nearby didn't matter to them, or that the number mattered, but they couldn't specify a specific number.)

Table 4.51 Personal Preference for Number of Parties Camped within Sight or Sound

	Motor (n=274)	Oar (n=333)	Private (n=108)	Guides (n=71)	p
Mean (for those giving a number)	0.59	0.41	0.26	0.43	.21[1]
Median	0	0	0	0	
% Who prefer zero	64	76	77	79	<.0005[2]

[1]ANOVA
[2]Chi-square test

Figure 4.15 Responses to Question about Personal Preference for Number of Parties Camped Within Sight or Sound



Number of Encounters Recalled

The questionnaire asked respondents to recall how many other trips they saw, for the days that they saw the most and the fewest. (We chose to ask the question this way, rather than for each day of the trip, because we believed that respondents would not be able to recall each day of the trip accurately and because we wanted to reduce respondent burden.) The general nature of the question suggests that responses probably included all encounters, whether they occurred on the river, at attraction sites, or at camp (Table 4.52). (In retrospect, for easier comparison with observer data and NPS standards, we probably should have asked about river, attraction site, and camp encounters separately.) On average, respondents indicated meeting about one other group

on the day when they saw the fewest other groups, although between 41 and 53% reported having a day without any encounters. There were no significant differences in the maximum number of encounters recalled among the three groups, despite differences in the speed of their trips. Although the average maximum values are relatively small (4 to 6 groups encountered), the large standard deviations indicate high levels of variability across respondents within each group. In fact, a few respondents reported seeing more than 30 other groups in a day.

Guides displayed interesting differences from other respondents. For example, 62% said they had a day with no encounters. The average on the least busy day was significantly less than for commercial and private boaters, although the average on the busiest day was similar to that reported by the other groups. The reasons for these differences are not known.

Table 4.52 Respondents' Recollection of Encounters of Busiest and Least Busy Day

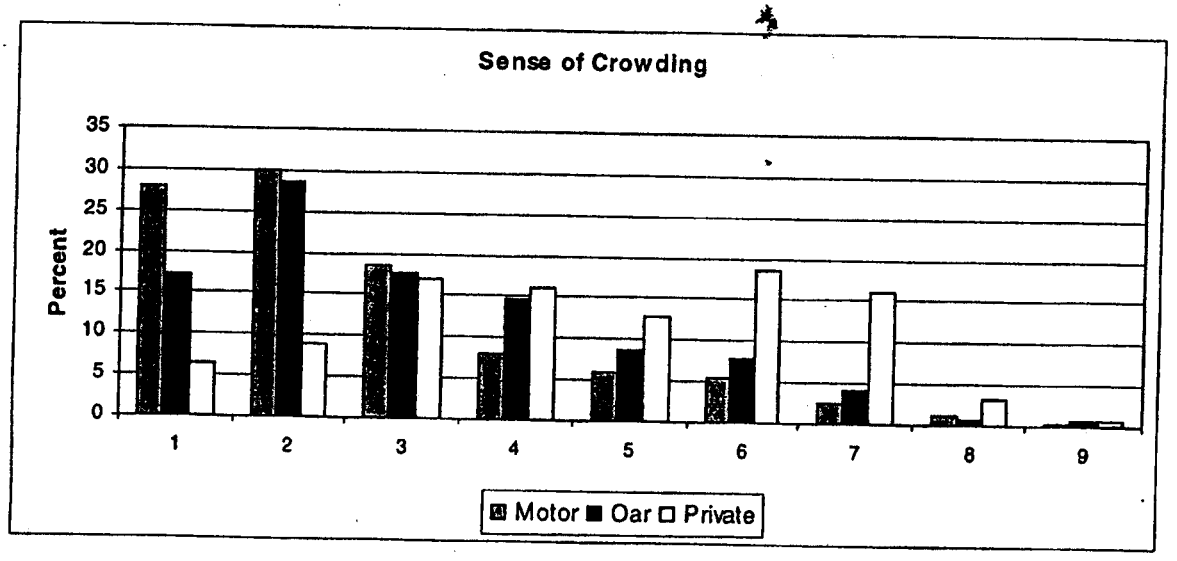
	Motor (n=453)	Car (n=431)	Private (n=120)	Guide (n=102)	p^1
	-----Number of Encounters-----				
Busiest day (average number of groups)	4.95	4.71	6.07	5.20	.34
Standard deviation	5.66	8.66	7.14	5.95	
Least busy day (average number of groups)	1.32^{a}	0.82^{ab}	1.04^{ab}	0.58^{b}	.001
Standard deviation	2.34	1.82	1.64	0.92	
	-----Percent-----				
% reporting a day when they saw no other groups at all	41	53	43	62	

[1] ANOVA. Numbers with different superscripts within each row are different at α=.05.

Evaluation of Encounters

In addition to collecting information about recollections of the actual number of encounters between groups, the questionnaire asked boaters to give their reactions to the level of use and encounters they had. A commonly used question asks respondents to indicate how crowded they feel on a 9-point scale, where 1 = not at all crowded and 9 = extremely crowded. On average, private boaters felt the most crowded, and motor passengers the least (Figure 4.16 and Table 4.53). These numbers indicate relatively low levels of crowding among commercial passengers and guides. Private boaters, on the other hand, were more likely to feel slightly or moderately crowded.

Figure 4.16 Crowding[1]



[1] 1 = not at all crowded, 3 = slightly crowded, 5 = moderately crowded, and 9 = extremely crowded.

Table 4.53 Crowding

	Motor (n=453)	Oar (n=439)	Private (n=124)	Guide (n=102)	p
	-----Percent-----				
Not at all (1-2)	57.8	25.8	15.3	49	
Slightly (3-5)	32.7	41.0	46.0	36	
Moderately (6-7)	8.2	11.8	34.7	13	
Extremely (8-9)	1.3	1.4	4.0	2	.000[1]
	-----Mean Crowding-----				
Mean (9-point scale)	2.66[a]	3.15[a]	4.60[b]	3.14[a]	.000[2]

[1]Chi-square test
[2]Numbers with different superscripts are different at α=.05, ANOVA

Compared to other rivers studied, levels of crowding were low among motor passengers and moderate among oar passengers and private boaters (Table 4.54). On the highly restricted Rogue River, 68% of boaters felt at least some level of crowding (3 or higher on the 9-point scale). On the extremely popular lower McKenzie River in Oregon, 86% of boaters felt crowded. Interestingly, Shelby et al. (1989) reported that 72% of rafters in the Grand Canyon felt some degree of crowding in 1985. If this number is an average across all types of boaters, crowding may be lower now than in the past.

Table 4.54 Proportion of Boaters Feeling at Least Some Crowding on Various Rivers

River	Year	Proportion Feeling Crowded[1]
Deschutes – Weekends	1985	100
Deschutes – Weekdays	1985	88
Lower McKenzie, Oregon	1996	86
Grand Canyon, Private	**1998**	**85**
Grand Canyon, Commercial Oar	**1998**	**74**
Upper Clackamas	1988	70
Rogue	1986	68
Snake, Hells Canyon	1979	53
Grand Canyon, Commercial Motor	**1998**	**42**
Klamath, Oregon	1988	38
Upper Clackamas	1994	35
Illinois, Oregon	1977	26

[1]3 or higher on 9-point scale.

A set of statements, repeated from the 1976 study, asked boaters to evaluate the encounters they had using the 4-point agree-disagree scale. Despite the relatively large proportion of commercial oar and private boaters reporting feeling crowded in Table 4.54, these results (Table 4.55 and Figures 4.17-4.18) indicate that the majority of commercial passengers and about half of private boaters did not feel they had too many encounters and didn't really pay attention to other groups very often. Less than about one-third felt they had to share attraction sites too often, or would have enjoyed the trip more if they had seen fewer people on the river or at attraction sites. However, despite this, no one wanted to see more people than they actually saw.

Table 4.55 Mean Level of Agreement with Statements about Encounters[1]

Mean	Motor (n=457)	Oar (n=438)	Private (n=123)	Guide (n=105)	p^2
I would have enjoyed meeting more other parties during the trip	-1.39[a]	-1.66[a]	-1.46[a]	-1.13[b]	.000
Too often we had to camp near other parties	-1.58[a]	-1.47[a]	-0.80[a]	-0.80[b]	.000
I enjoyed meeting people from other trips	-0.44[ab]	-0.75[a]	-0.35[b]	0.32[c]	.000
I don't think we met too many people during our trip down the river	1.11[a]	0.78[ab]	0.06[c]	0.73[b]	.000
Too often we had to share a place like Deer Creek Falls with other groups	-0.85[a]	-0.68[a]	0.49[c]	-0.04[b]	.000
I would have enjoyed the trip more if we had seen less people at side stops	-0.76[a]	-0.24[b]	0.67[c]	-0.18[b]	.000
I didn't really pay much attention most of the time to how many other groups were around	0.42[a]	0.10[a]	-0.54[b]	-0.44[b]	.000
It would not have bothered me to see more people at side stops	-0.40[a]	-0.76[ab]	-1.13[b]	-0.72[a]	.000
I would have enjoyed the trip more if there hadn't been so many boats going by	-1.15[a]	-0.51[b]	-0.16[c]	-0.58[b]	.000
I would have enjoyed the trip more if we had seen less people while floating on the river	-0.90[a]	-0.23[b]	0.45[c]	-0.59[ab]	.000
I wish we had seen more people at side stops	-1.30[a]	-1.56[b]	-1.62[b]	-0.45[ab]	.000
I wish we had seen more people while floating on the river	-1.32[a]	-1.59[b]	-1.59[b]	-1.39[ab]	.000

[1] 4-point scale: +2 (strongly agree), +1 (probably agree), -1 (probably disagree), -2 (strongly disagree).
[2] ANOVA. Numbers with different superscripts within each row are different at α=.05.

Private boaters differed markedly from commercial passengers on these questions. Although 53% said they didn't meet too many people overall, 66% said they had to share attraction sites too often and 73% would have enjoyed the trip more if they had seen fewer people at attractions. Similarly, a majority would have enjoyed the trip more if they hadn't seen so many others on the river.

Guides differed somewhat from others on these questions. For example, in their evaluations of sharing attraction sites they were intermediate between commercial and private

boaters. In general, they seemed most similar to commercial oar passengers. The main difference was that 59% of guides enjoyed meeting others; this was much higher than for the other groups.

Figure 4.17 Percent Agreeing With General Statements about Encounters

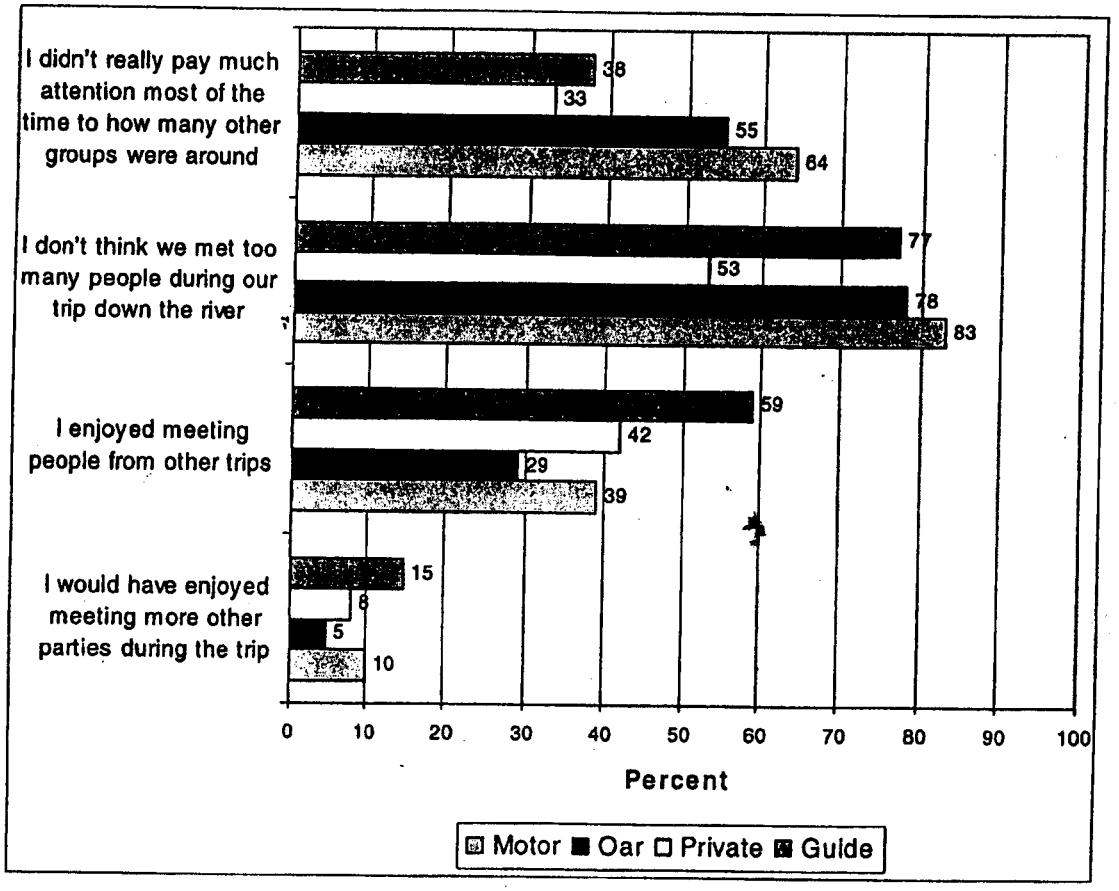


Figure 4.18 Percent Agreeing With Statements about Encounters at Attraction Sites

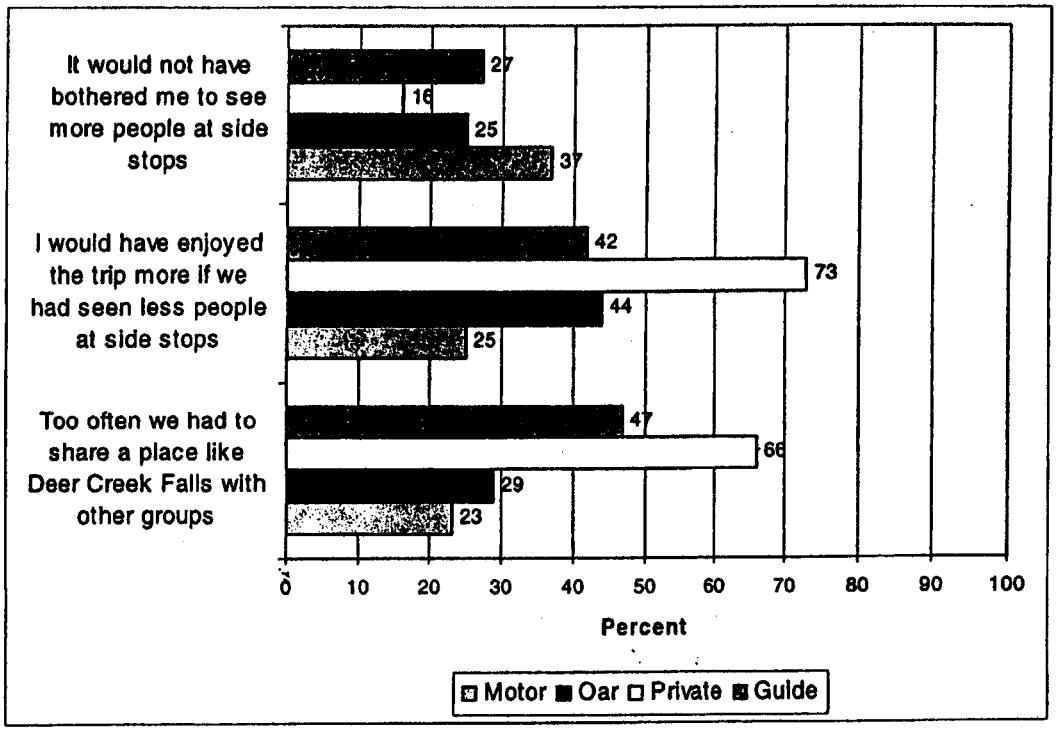
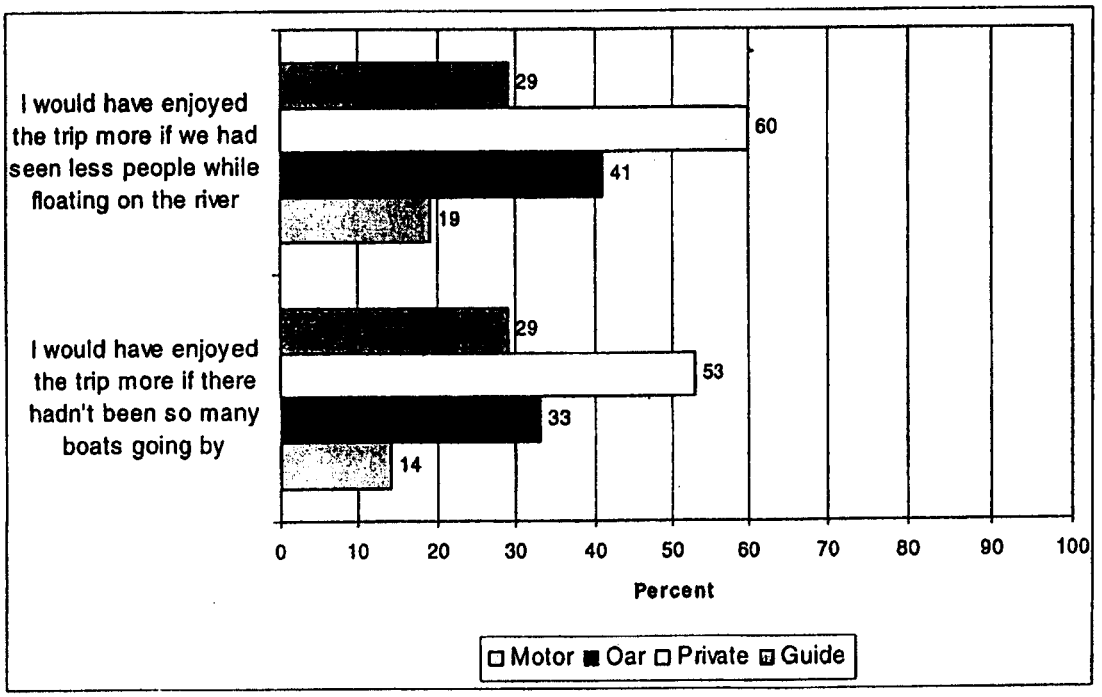


Figure 4.19 Percent Agreeing With Statements about Encounters on the River



Standards for Number of Encounters

Three questions were designed to help the National Park Service evaluate its standards for encounters on the river. In each case, respondents were asked whether certain types of encounters (used as indicators) matter to them, and to state what the maximum acceptable number of encounters of that type would be. One question asked, "what is the maximum number of other parties that could camp within sight or sound of you on the river before it no longer felt like a 'wilderness' experience to you?" Another asked, "what is the maximum number of other parties you would tolerate seeing in a day on the Colorado River in the Grand Canyon before it no longer felt like a 'wilderness' experience to you?" These two questions had the same response format; the respondent could indicate that the number "doesn't matter to me," indicate that "the number matters, but I can't specify a number," or write a number in a blank on the questionnaire. The third question asked, "what is the maximum amount of time you would tolerate being in sight of other river parties in a day on the Colorado River in the Grand Canyon before it no longer felt like a 'wilderness' experience to you?" This question offered the first two response options from the other questions, but the third option was "it is OK to be in sight of other boaters 0-10-20-30-40-50-60-70-80-90-100% of the time," and the respondent was instructed to circle a number. It is important to bear in mind when examining responses that these questions stipulated a "wilderness" experience, and that other results might have occurred if the question had been phrased differently.

Most boaters stated a maximum number of groups camped in sight or sound that they considered acceptable for a wilderness trip (Figure 4.20 and Table 4.56): 32 to 39% of each type of boater said it is not acceptable to have any other groups camped within sight and sound in a wilderness. Almost no boaters said this indicator did not matter to them. Fewer respondents

stated a *maximum acceptable* number than expressed a *preference* for groups camped nearby in an earlier question (see Figure 4.15). The higher percentage of "can't specify" answers in the personal standards question may indicate increased difficulty for respondents with the concept of "acceptability." It seems logical that more respondents have and know their preferences than would be able to discuss what is "acceptable."

For this question, oar passengers and private boaters were quite similar. Guides were the most likely to say that the number of other groups camping within sight or sound doesn't matter to them, and they were most similar to the motor passengers in the percent giving a number for the maximum acceptable in wilderness.

Figure 4.20 Responses to Question about Personal Standards for Number of Parties Camped Within Sight or Sound for a Wilderness Experience

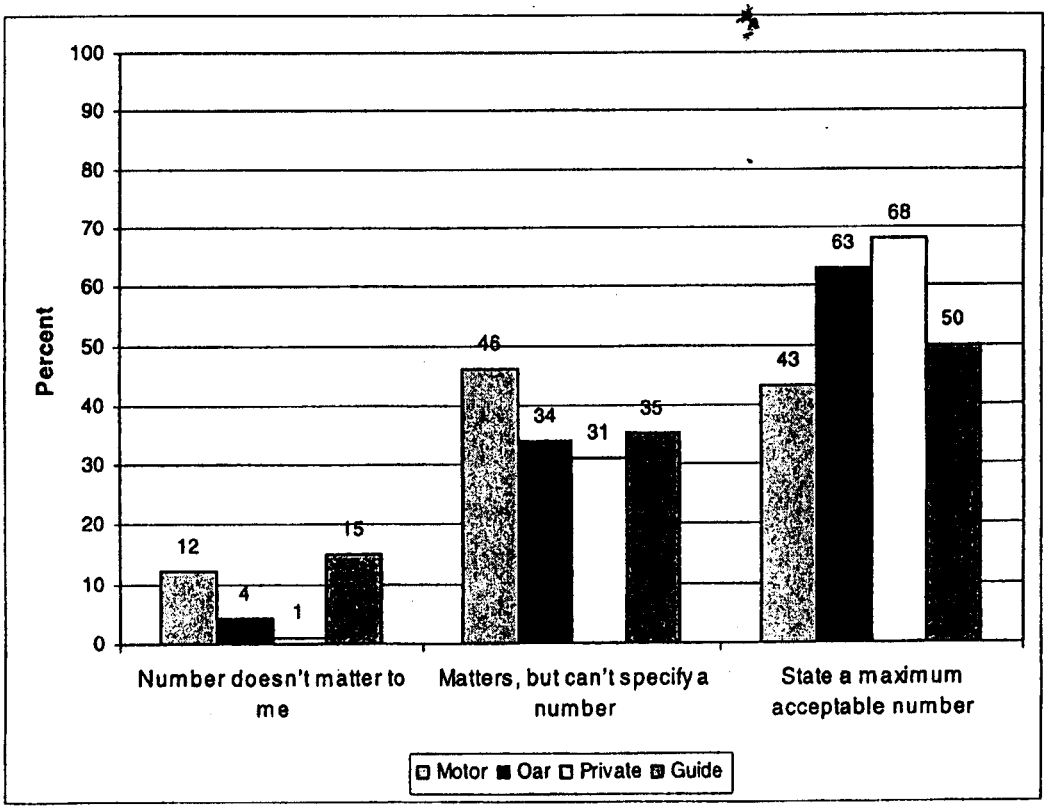


Table 4.56 Personal Standards for Number of Parties Camped within Sight or Sound for Wilderness Experience

	Motor (n=187)	Oar (n=263)	Private (n=82)	Guides (n=51)	p
Mean (for those giving a number)	1.48	1.04	0.86	1.15	.11[1]
Median	1	1	1	1	
% Who accept no other parties	32	37	39	35	<.0005[2]

[1]ANOVA
[2]Chi-square test

Most respondents also felt that the number of other groups they see in a day is a significant influence on the feeling of wilderness (that is, they say the number of encounters matters to them), and many had an opinion about the maximum number that is acceptable (Figure 4.21 and Table 4.57). Motor passengers and guides were least likely to be able to specify a personal standard (41% and 48% respectively), but 60% of oar passengers and 71% of private boaters provided a number. Among those with a personal standard, private boaters would tolerate the fewest encounters in a day (mean=2.5), while guides tolerate the most (mean=5.2). Although these differences are statistically significant, they seem relatively small in a practical sense.

Figure 4.21 Personal Standards for Daily Encounters on the River for Wilderness Experience

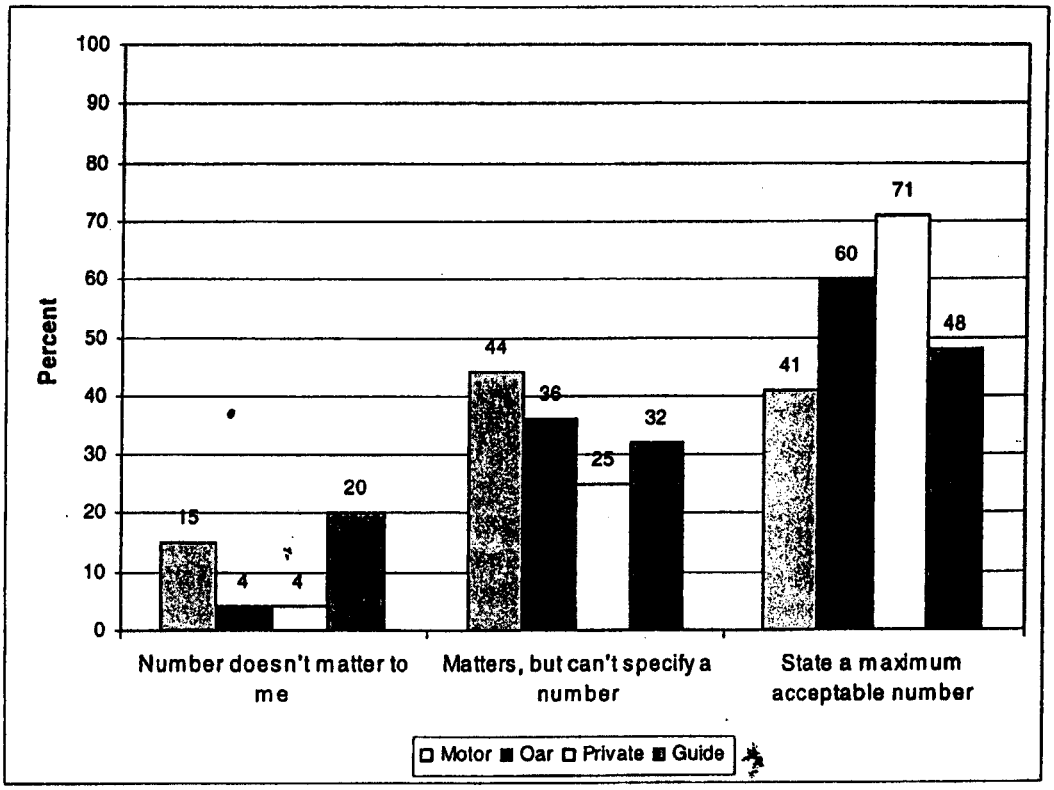


Table 4.57 Personal Standards for Maximum Daily Encounters on the River for Wilderness Experience

	Motor (n=175)	Oar (n=250)	Private (n=83)	Guides (n=46)	p
Mean (for those giving a number)	4.35[ab]	3.36[ab]	2.51[a]	5.16[b]	.015[1]
Median	3	3	2	3	
% Who say zero is the maximum	6	6	8	13	<.0005[2]

[1]ANOVA. Numbers with different superscripts are different at α=.05.
[2]Chi-square test

More than two-thirds of each type of boater were willing or able to state a personal standard for the percent of time it is acceptable to be in sight of other trips during the day for a wilderness-type experience (Figure 4.22 and Table 4.58). As with standards for the number of encounters, the differences in mean values are statistically significant, but small. On average, oar passengers and private boaters said they should not be in sight of others more than about 13% of the time or it would cease to feel like wilderness. Motor passengers and guides were only slightly higher, with 16-17% of the time being the maximum acceptable.

Figure 4.22 Responses to Questions About Personal Standards for Percent of Time in Sight of Others for Wilderness Experience

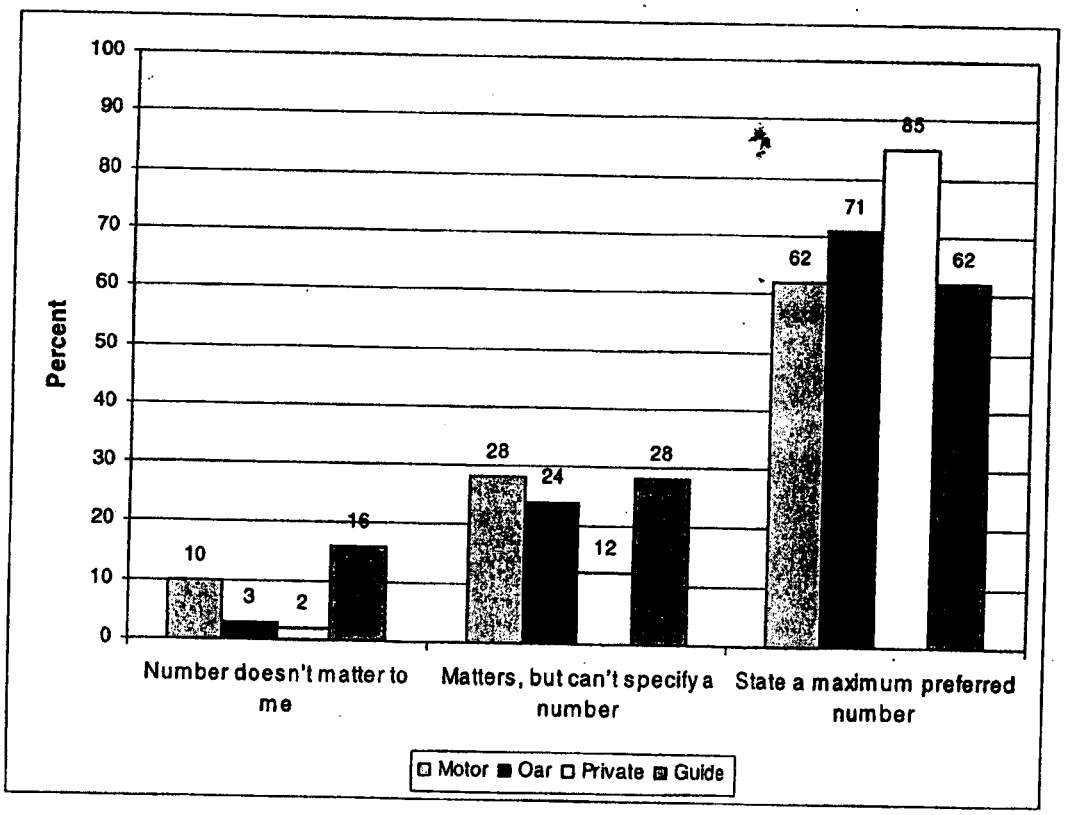


Table 4.58 Personal Standards for Percent of Time in Sight of Other Trips for Wilderness Experience

	Motor (n=270)	Oar (n=313)	Private (n=105)	Guides (n=63)	p
Mean (for those giving a number)	16.1	12.8	12.8	16.9	.002[1]
Median	10	10	10	15	
% saying zero	7	12	12	10	.13[2]

[1]ANOVA. No pair-wise differences were found.
[2]hi-square test

Preferences for Types of Encounters

Many boaters, especially commercial oar passengers and private boaters, had opinions about the types of groups they prefer to meet on the river. For example, 84% of oar passengers and 93% of private boaters preferred to meet oar trips, while 81% of motor trip passengers were indifferent about meeting oar versus motorized trips (Table 4.59). This reinforces the understanding that oar passengers and private boaters generally object to some aspects of motorboats, while motor passengers do not object to either motor or oar boats. Most guides were similar to commercial motor passengers in their indifference to this aspect of encounters.

Table 4.59 Preference for Meeting Oar Versus Motorized Trips on the River

	Motor (n=449)	Oar (n=436)	Private (n=124)	Guide (n=103)
	-----*Percent*-----			
Prefer to meet oar trips	13	84	93	36
Prefer to meet motorized trips	6	0	1	4
Makes no difference	81	16	7	60

p<.0005, Chi-square test

Over half of the commercial passengers were indifferent about meeting private versus other commercial trips, but about one-third preferred to meet commercial trips (Table 4.60). In contrast, more than three-quarters of private boaters preferred to meet other private trips rather than commercial trips. This suggests a potential for conflict between the private and commercial user groups. It would be interesting to explore the reasons underlying these sentiments. Guides were almost identical to both commercial groups on this issue.

Table 4.60 Preference for Meeting Private Versus Commercial Trips on the River

	Motor (n=446)	Oar (n=423)	Private (n=124)	Guide (n=102)
	-----*Percent*-----			
Prefer to meet private trips	5	5	79	5
Prefer to meet commercial trips	32	38	0	33
Makes no difference	64	57	22	62

p<.0005, Chi-square test

Most oar passengers and private boaters preferred to meet small trips, while 46% of motor passengers shared this preference (Table 4.61). As with other preference items, motor passengers were more likely not to care whom they encounter, while private boaters were most likely to care.

Table 4.61 Preference for Meeting Different Size Trips on the River

	Motor (n=445)	Oar (n=431)	Private (n=124)	Guide (n=102)
	-----Percent-----			
Prefer to meet small trips (20 persons or less)	46	75	89	48
Prefer to meet medium-sized trips (20-30 persons)	15	11	2	20
Prefer to meet large trips (30-40 persons)	3	0	0	4
Makes no difference	36	14	10	28

p<.0005, Chi-square test

This question is one on which motor passengers were more similar to other groups. Because there was the most diversity in group size on motorized trips, it is also useful to explore the relationship between one's own group size and preferences for encounters. A majority of those in small or medium-sized groups preferred to meet small groups, as did 43% of those in large groups (Table 4.62). Even those in large groups did not prefer to encounter large groups.

Table 4.62 Preference for Meeting Different Size Trips on the River, by Own Trip Size

	Own Trip Size		
	10-20	21-30	31-40
	-----Percent-----		
Prefer to meet small trips (20 persons or less)	77	53	43
Prefer to meet medium-sized trips (20-30 persons)	8	20	16
Prefer to meet large trips (30-40 persons)	0	0	3
Makes no difference	16	26	39

p<.0005, Chi-square test

Two questions asked boaters to respond to possible trade-offs in encounters. One asked whether they would prefer to meet fewer large groups or more smaller groups, if the total number of people remained the same in each case (Tables 4.63 and 4.64). The other asked if they would prefer to have shorter encounters with motorboats or longer encounters with oar trips (Table 4.65). Sentiments were more divided than for some other types of preferences: between 51 and 62% of all recreational boaters would prefer to meet the larger number of small groups. Guides were quite different from either commercial passengers or private boaters, with 69% preferring the encounters with fewer, larger groups.

This question is not directly comparable to the data presented in Tables 4.61 and 4.62, because it forced respondents to choose, without offering a "makes no difference" option as was presented in the other question. Given the large percentage of motor passengers who appeared indifferent to encounters in the other tables, one might have expected a similar pattern if such an option had been presented for the question in Table 4.63.

Table 4.63 Trade-off Between Meeting Large Versus Small Trips

Prefer to meet:	Motor (n=416)	Oar (n=411)	Private (n=117)	Guide (n=98)
	-----*Percent*-----			
3 large parties (20-40 persons) and no one else	48	42	38	69
6 small parties (10-20 persons) and no one else	51	57	62	31
Makes no difference (volunteered)	1	0	0	0

p=.068, Chi-square test, among motor, oar, and private boaters

Again, one might ask if there is a relationship between one's own group size and preferences for encounters. In fact such a relationship exists, though the differences are minimal in a practical sense (Table 4.64).

Table 4.64 Trade-off Between Meeting Large Versus Small Trips, by Own Trip Size

	Own Trip Size		
	10-20	21-30	31-40
	-----Percent Preferring-----		
3 large parties (20-40 persons) and no one else	39	47	44
6 small parties (10-20 persons) and no one else	61	53	52
Makes no difference (volunteered)	0	0	5

p=.001, Chi-square test

Preferences for longer encounters with oar trips over shorter encounters with motorized trips displayed much more consensus within each group, and large differences of opinion between the types of boaters (Table 4.65). Eighty percent of motor trip passengers prefer the shorter encounters with motorized trips, while 80% of both commercial oar and private boaters prefer to be in sight of oar trips for a longer amount of time. This demonstrates that oar boaters simply prefer not to meet motorized trips, even if they go past more quickly. Guides were most similar to commercial motor passengers.

Table 4.65 Trade-off Between Meeting Motorized Versus Oar Trips

Prefer to meet:	Motor (n=385)	Oar (n=404)	Private (n=117)	Guide (n=95)
	-----*Percent*-----			
A trip of 35 people on 2 motor boats that passes quickly	80%	17%	23%	64
A trip of 35 people on 8 oar boats that goes by less quickly	18	83	77	34
Makes no difference (volunteered)	2	1	0	2

p<.0005, Chi-square test

Willingness to Adjust to Reduce Encounters

Most boaters did not have their preferred experience in terms of the number of encounters on every day of their trip; between 64 and 93% saw more than their preferred number on at least one day of the trip (Table 4.66). But how important is it to them to achieve this preferred level? We asked a series of questions about willingness to alter behaviors or make sacrifices to achieve the desired level of encounters (Tables 4.67 and 4.68).

Table 4.66 Comparison of Preferred Number of Encounters per Day to the Maximum Number of Encounters on the Busiest Day

	Motor (n=170)	Oar (n=242)	Private (n=79)
	-----*Percent*-----		
Saw more than preferred	64	79	93
Saw the preferred number	19	12	4
Saw less than the preferred number	16	9	4

p<.0005, Chi-square test

A majority of all groups would accept less flexibility in scheduling of dates, it if meant achieving the desired number of encounters, and a majority of oar passengers and private boaters would also go in April or October (Table 4.67). However, a majority rejected other strategies to have fewer encounters. Respondents generally seemed unwilling to wait longer or pay more. Commercial motor passengers were not willing to go during the off-season, but private boaters (at least those surveyed in this study) were. Guides were especially reluctant to endorse an option that would require them to follow a more strict schedule of stops during their trip.

Table 4.67 Willingness to Adjust to Achieve Preferred Number of Encounters

Adjustment	Motor (n=385)	Oar (n=397)	Private (n=118)	Guide (n=102)	p^1
	-----*Percent*-----				
Have less flexible schedule of trip departure dates	52	68	64	54	.000
Follow a more strict schedule during the trip	44	50	44	13	.000
Take the trip in April or October	36	63	86	85	.000
Wait two years longer to go on the trip	31	34	38	na	.291
Pay $500 more	31	46	40	na	.000

[1]Chi-square test

At attraction sites, 64% of oar passengers and 86% of private boaters would hike farther to reduce encounters (Table 4.68). In none of the groups was a majority willing to miss any attraction site just to have solitude at one of the other sites.

Table 4.68 Willingness to Adjust to Have Fewer Encounters at Attraction Sites

Adjustment	Motor (n=420)	Oar (n=414)	Private (n=121)	Guide (n=102)	p^1
	-----*Percent*-----				
Miss stopping at an attraction if you were assured of seeing no one at one of the others	17	25	35	42	.000
Miss stopping at an attraction if you saw only half as many people at one of the others	15	25	26	30	.000
Hike further at an attraction to avoid seeing other people	45	64	86	81	.000

[1]Chi-square test

These questions leave one not knowing whether the unwillingness to make certain sacrifices is because (1) seeing fewer people simply wouldn't make the trip that much better or (2) the cost of the sacrifice is simply too great. Additional research would help understand boaters' reasons more fully.

Opinions About River Management

Limits on Group Size

Several questions asked whether boaters supported various management actions or policies that ranged from restrictive actions to those that would provide additional amenities. Nearly all boaters agreed that group size should be limited (Table 4.69). On average, respondents believed a group size between 20 (private boaters) and 29 (commercial motor passengers) is appropriate. The small standard deviations indicate relatively high levels of agreement.

Table 4.69 Opinions About Group Size Limits

	Motor (n=426)	Oar (n=422)	Private (n=122)	Guide (n=103)	p
	-----Percent-----				
There should be a group size limit	82	94	98	89	.000[1]
Group Size Should Be 0-10	3	2	0	0	
11-20	28	35	74	17	
21-30	38	51	24	58	
31-40	25	9	2	25	
>40	6	2	0	0	
	-----Group Size-----				
Average group size should be:	28.8[a] (10.1)	25.5[b] (7.4)	20.0[c] (5.2)	28.5[b] (6.5)	.000[2]
Median	30	24	20	30	
Minimum	3	8	12	12	
Maximum	80	55	40	40	

[1]Chi-square test
[2]ANOVA. Numbers with different superscripts are different at α=.05.

As with other questions pertaining to group sizes, it is interesting to know whether one's own group size relates to preferences for limits. Such a relationship exists, but the influence is small (Table 4.70). Even among those in large groups, 89% believed group sizes should be limited. More importantly, the maximum acceptable group size on average was 30, even for those in groups that had more than 30 passengers.

Table 4.70 Opinions About the Desirability of Group Size Limits, by Own Trip Size

	Own Trip Size			
	10-20	21-30	31-40	*p*
	-----Percent-----			
There should not be a limit	5	15	11	
There should be a limit	96	85	89	.000[1]
	-----Number of People Per Group -----			
Mean group size preferred	24[a]	28[b]	30[b]	.000[2]

[1]Chi-square test

[2]ANOVA. Numbers with different superscripts are different at α=.05.

Actions to Reduce Crowding

Because solitude and crowding are two important influences on the river experience, the National Park Service policy is to avoid unacceptably high levels of crowding and provide opportunities for solitude. Therefore, managers are interested in how the public would react to possible ways to reduce crowding. Several options were developed for boaters to evaluate (Table 4.71). Only 11% of private boaters and oar passengers, and 20% of motor passengers, believed the NPS should do nothing because "reducing crowding is not as important as making sure people can see this unique place." Even fewer said the NPS should do nothing because boaters seeking solitude can go somewhere else. These findings show that boaters do support the general policy of acting to reduce crowding when it reaches the point that most people say they feel too crowded. However, it is also important to note that among current users (at least commercial passengers) most do not feel that the Canyon is currently too crowded, and it is difficult to know what that threshold of crowding would be. (Figure 4.17 presented information that 53% of private boaters, 78% of oar passengers, and 83% of commercial passengers agreed with the

statement, "I don't think we met too many people". Figure 4.4 showed that 50% of private boaters, 17% of oar passengers, and 11% of motor passengers said the canyon is "too crowded" to be considered a "wilderness.") Of the user groups, private boaters were the closest to feeling that the Canyon is becoming too crowded.

Table 4.71 Support for Actions NPS Should Take To Reduce Crowding

	Motor (n=435)	Oar (n=425)	Private (n=123)	Guide (n=104)	p^1
	-----Percent-----				
Reduce the number of trips allowed to launch	37	45	24	24	.000
Provide information about use levels and let boaters make up their own minds about when to come	26	28	42	39	.001
Shift some of the use to the off season	20	32	35	48	.000
Nothing – reducing crowding is not as important as making sure people can see this unique place	20	11	11	23	.000
Have trip leaders sign up for campsites	19	21	20	4	.001
Have trip leaders sign up for times that they can stop at attraction sites	15	14	9	2	.003
Nothing – when I want solitude I go to other rivers or places	11	7	15	11	.003
Charge higher fees for river trips	6	7	4	0	.003

[1]Chi-square test

Despite boaters' support for taking action if the canyon becomes too crowded, none of the management options provided was selected by a majority of any of the groups of boaters as an acceptable way to reduce crowding. The most favored option among commercial passengers was to reduce the number of launches, but private boaters did not prefer this option. Among them, providing information and shifting use to the off-season were acceptable to more people. Guides

were different in exhibiting greater support for shifting some use to the off season and much less enthusiasm for tighter scheduling of trips.

Boaters could write in other suggestions about how to deal with crowding, and 39 motor passengers (9%), 59 oar passengers (14%), and 57 private boaters (46%) did so. These suggestions ranged widely, and there was little consensus beyond private boaters' desire to reduce the amount of commercial use or balance the allocation of trips (Table 4.72). Commercial passengers were more likely to say that the current system is fine.

Table 4.72 Other Suggestions for Dealing with Crowding (Number of Comments)

	Motor	Oar	Private
Current system is fine; Use levels are fine	7	7	1
It's not too crowded	2	0	0
Don't allow more use	2	2	1
"Control use" or "schedule use"[1]	2	6	0
Grand Canyon is public land	3	0	0
Limit/reduce private trips	1	4	0
Limit private repeat use	1	0	0
Make privates follow same rules	1	2	0
Let guides have more say	2	2	0
Educate users	1	2	0
Assign departure times	6	2	1
Coordinate between trips; increase communication	2	5	0
Reduce group size (general)	1	2	3
Reduce groups size (specifically commercial)	0	0	6
Allow only paddle trips	0	1	0
Ban motors entirely	0	8	7
Reduce number of motor trips	0	1	5
Make allocation more equitable to privates	0	0	14
Reduce commercial use	0	0	26
Increase the number of private user days	0	0	10
Have first come/first served for all boaters	0	0	3
Have all boaters on a lottery	0	3	1
Lower prices, current costs are elitist	1	1	2
Charge commercial trips more	0	0	1

[1] The specific comments provided indicated that these respondents were unaware that there is a system in place that controls and schedules use.

One interesting point arises from some of these comments. Some commercial passengers displayed misconceptions about the current system of allocation and management. For example, some did not know that use is regulated or believe that private boaters must follow the same rules as commercial trips. Such comments suggest that increased communication could help overcome some potential sources of conflicts.

Of 17 other possible management actions to deal with various issues other than crowding, only two received at least 50% support from respondents in all three groups: encouraging use of quieter motors and increasing the number of trips in winter (Table 4.73). A majority of motor passengers also supported encouraging outfitters to provide a range of trip sizes. Five of the choices would increase amenities at campsites, and all five were opposed by a substantial majority of boaters. A majority also opposed limiting the number of times a person can float the river and increasing the number of trips to reduce waiting times. A majority of commercial passengers opposed altering flows to protect beaches and requiring that all trips be at least seven days.

Guides were more likely to support increasing winter trips, planting vegetation, altering flows to protect beaches, and requiring longer trips. They were more likely to oppose creation of trails, increasing the number of trips while decreasing group size, and installing toilets.

Table 4.73 Percent Supporting and Opposing Management Policies and Actions

	Support				Oppose			
	M[1]	O	P	G	M	O	P	G
	-----Percent-----							
Encourage use of quieter motors	63	67	82	81	12	11	4	8
Encourage outfitters to provide a range of trip sizes	54	37	45	45	13	18	5	19
Increase number of trips in winter	50	50	54	74	12	8	9	6
Allow private boaters to hire guides	41	42	35	47	25	27	20	31
Request passengers hike together	37	33	26	31	32	35	46	45
Designate a few sites for large groups only	36	32	39	39	43	43	38	46
Plant native vegetation to stabilize beaches	35	37	41	50	37	31	28	25
Create short hiking trails at popular campsites	22	21	20	7	61	59	47	75
Alter flows to protect beaches	20	22	38	60	63	59	42	22
Increase number of trips, but reduce group size	18	19	24	16	37	36	34	60
Require minimum of 7 day trip	17	15	28	39	65	61	47	40
Limit the number of times a person can float	15	18	19	15	70	65	70	76
Install toilets at popular campsites	14	9	8	3	75	78	87	95
Flatten areas to make more campsites	9	9	10	14	81	80	82	76
Increase number of trips to reduce waiting times	8	9	16	9	71	68	60	74
Provide picnic tables at campsites	6	4	3	1	88	90	75	99
Install interpretation at attraction sites	4	7	4	2	85	83	91	97

[1]M = commercial motor passengers, O = commercial oar passengers, P = Private, G = guide

For 9 of the 17 items, there was no significant difference among the groups of boaters in the mean level of support (Table 4.74 and Figure 4.23). Considering the wide disparities seen in answers to other questions, this seems to indicate that management actions – at least within those listed here – are an area of relative agreement among boaters.

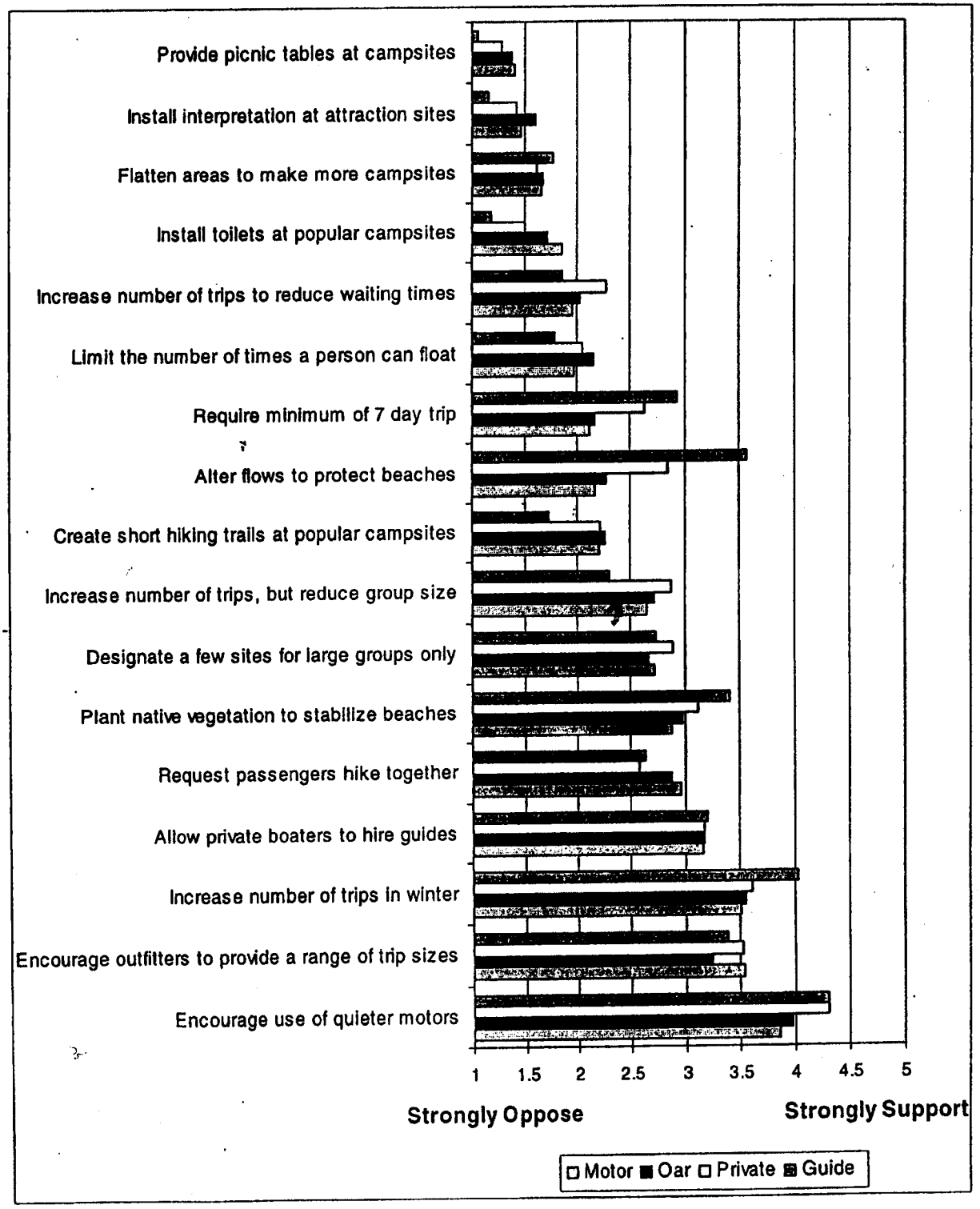
Table 4.74 Mean Level of Agreement About Other Management Policies and Actions[1]

	Motor (n=439)	Oar (n=424)	Private (n=117)	Guide (n=104)	P^2
Encourage use of quieter motors	3.86[a]	3.97[ab]	4.30[b]	4.30[b]	.000
Encourage outfitters to provide a range of trip sizes	3.54[a]	3.24[b]	3.52[a]	3.38	.002
Increase number of trips in winter	3.51[a]	3.55[a]	3.61[a]	4.03[b]	.000
Allow private boaters to hire guides	3.16	3.18	3.18	3.2	.986
Request passengers hike together	2.97[a]	2.88[ab]	2.58[b]	2.64[ab]	.014
Plant native vegetation to stabilize beaches	2.88[a]	2.98[a]	3.12[ab]	3.41[b]	.003
Designate a few sites for large groups only	2.72	2.67	2.89	2.74	.484
Increase number of trips, but reduce group size	2.66[a]	2.72[a]	2.88[a]	2.30[b]	.001
Create short hiking trails at popular campsites	2.21[a]	2.27[a]	2.22[a]	1.73[b]	.002
Alter flows to protect beaches	2.16[a]	2.28[a]	2.85[b]	3.57[c]	.000
Require minimum of 7 day trip	2.12[a]	2.17[a]	2.64[b]	2.93[b]	.000
Limit the number of times a person can float	1.97	2.15	2.05	1.78	.058
Increase number of trips to reduce waiting times	1.95[a]	2.02[ab]	2.28[b]	1.85[a]	.014
Install toilets at popular campsites	1.86[a]	1.72[a]	1.51[bc]	1.18[c]	.000
Flatten areas to make more campsites	1.66	1.68	1.62	1.77	.771
Install interpretation at attraction sites	1.47[a]	1.61[a]	1.42[ab]	1.16[b]	.000
Provide picnic tables at campsites	1.41[a]	1.38[a]	1.28[ab]	1.06[b]	.001

[1]5-point scale: 1 (strongly oppose), 3 (neutral), 5 (strongly support)

[2]ANOVA. Numbers with different superscripts within each row are different at α=.05.

Figure 4.23 Mean Level of Support for Management Actions



Lara M Schmit
08/04/2004 01:19 PM

To: Jeffrey E Lovich/BRD/USGS/DOI@USGS
cc: chris.updike@nau.edu
Subject: Re: Closing the loop on economics

Jeff,

Sorry to interrupt your conversation. I was trying to see if we can come to a consensus of what is needed for the economics element of the report based on the research history of Douglas and Harpman.

First, their work together has focused on estimating expenditures and jobs stemming from recreation activities in the Glen Canyon Dam region, which is something we need. Harpman's work deals with estimating the costs of restricting dam operations to improve downstream resources, also something we need and is a higher priority.

If we stay with the ecosystem approach to organizing the report, then we don't want an economics chapter that functions as a catch all..power, recreation, nonuse valuation. I suggest that we ask for two contributions: (1) costs related to adaptive management experiments for power and (2) value of recreation.

Harpman's paper, Assessing the Short-Run Economic Cost of Environmental Constraints on Hydropower Operations at Glen Canyon Dam, could in large measure serve as a template for item 1. In the paper attaches a dollar amount to the shift from historical management to MLFF that is much cited. He creates a model for evaluating the short-run cost of management changes related to adaptive management. He also clearly explains how a peaking plant functions to generate revenue and the context for changing historical management patterns. It would be great to expand the paper to provide cost estimates for recent experiments/management actions, including 2000 LSSF and and 2003 experimental flows. The drought will need to be factored in after 2000. Harpman's model was developed before the drought set in. What are the implication of the lower elevation of Lake Powell, which according to WAPA "has caused a loss of generator efficiency resulting in loss of approximately 365 MW of capacity (nearly 30% of plant capacity.)" Seems like this chapter also has to tackle the possibility that if the drought continues Lake Powell could reach minimum power pool and the Basin Fund could be depleted. Additionally, as you suggested when we spoke this morning, there is a need for some sort of valuation of the benefits to the ecosystem derived from the experiments. Your questions: What is the societal value of a humpbacked chub? Harpman has apparently done work on nonuse valuation, but we are still waiting to get a copy of his paper.

For item 2, it would be great to have is an update on the economic impacts of water-based recreation. The papers that Douglas and Harpman did together on the topic are now 10 years old. Perhaps it would be a simple matter for them to update their previous work?

I'll drop a copy of the Harpman paper and the WAPA report by your office. I'm headed out, so you can reach me at my home office number, 779-3186 or I will talk with you in the morning.

Cheers, Lara

Jeffrey E Lovich

Jeffrey E Lovich
08/03/2004 04:25 PM

To: Lara M Schmit/BRD/VOL/USGS/DOI@USGS
cc:
Subject: Closing the loop on economics

Lara,

If you could get me a paragraph or a brief outline of what we want captured relative to economics I will call Aaron Douglas. Thanks.

Jeff

Jeff Lovich, Ph.D.
Chief
USGS, Grand Canyon Monitoring and Research Center
2255 N. Gemini Drive
MS-9394
Flagstaff, AZ 86001-1600
(928)556-7094
FAX 556-7092
http://www.gcmrc.gov

\\ //
<:=(((()))>--
// \\

Chapter 5:
Social Conditions, Visitor Opinion, and Standards

Overview

This chapter brings together information from observers about encounters, information from boaters about their recollection and evaluation of encounters, and Park Service management standards. It begins with a discussion of the indicators/standards approach to management, because there are several controversial issues and assumptions that should be made explicit. It then describes current Colorado River management standards, as specified in the CRMP, which is followed by a section on visitors' personal standards for specific social conditions. Following the currently recommended practice among recreation researchers to take larger-scale perspectives, information is offered comparing Grand Canyon responses to those of boaters on other rivers. Management standards are compared to visitor standards to the extent possible, which is somewhat limited. The following section evaluates how well current conditions do or do not match management standards for river, attraction, and camp encounters. The final section discusses the implications of the findings.

Indicators and Standards in Recreation Management

Current planning frameworks such as Visitor Experience and Resource Protection (VERP) and Limits of Acceptable Change (LAC) call for the selection of indicators of resource and experience quality and for establishment of standards for each indicator. Based on monitoring, when conditions move outside the acceptable level specified in the standards,

management action is required to bring conditions back within standards. One commonly used indicator is the number of encounters per day, and Grand Canyon National Park has set standards with which trips should comply.

One source of information about indicators and standards, especially those pertaining to experience quality, is input from visitors. A commonly used approach, usually labeled the "normative approach," elicits personal standards from visitors for selected indicators. Most often in research, these standards pertain to encounters among groups. It is important to bear in mind that in the subsequent pages "management standards" refer to those in the river management plan, whereas "personal standards" refer to what individual recreational visitors articulate in response to survey questions.

An important consideration and matter of current debate in questioning visitors about personal standards is the specific nature of the question asked. It seems well-established that there are differences between what visitors *prefer* and what they will *tolerate*, and that preferences are usually for fewer encounters than are tolerable. Furthermore, we have begun to recognize that the term "tolerate" is poorly defined in much previous research: does it refer to the point at which a visitor will no longer return to a site? Does it entail any position about what management should do if conditions exceed standards? Such matters are important, because the contextual factors and trade-offs involved in real management and visitation decisions are difficult to convey in survey instruments, which jeopardizes the confidence we may have in the external validity of survey results. The more specific the question asked (e.g., "what is the maximum number of encounters with different groups – where encounters are defined as any visual contact of any duration with any other boating party, either on the river, at attraction sites, or at camp – that you consider to be acceptable for a wilderness-type trip – where wilderness is

defined as the most primitive type of setting – on any given day of a Colorado River trip, knowing that if that standard is imposed, 20% of the visitors who now go on the river will not be able to go, and that waiting times will double, but at the same time your chances of seeing other visitors on the river will drop to 50% from 70% and at attraction sites from 90% to 50%?"), the more confidence (perhaps) in the results, but the more difficult it becomes for visitors to answer. Apart from the unwieldy nature of the question itself, recreational users simply do not interact with the environment and other parties in reductionist, quantitative terms such as these. However, the more general the question (e.g., "How many encounters is too many?"), the more vague and imprecise it is; we cannot know what assumptions visitors make when they answer such questions, and therefore it becomes difficult to know how to use their input in meaningful ways.

Nevertheless, visitor input is crucial. Recreation experiences, including wilderness-like experiences and solitude, are subjective, and visitors are the best judges of what conditions affect their experiences and of whether they actually experience feelings such as solitude. Managers must try to identify the objective setting factors within their control that are conducive to desired experiences, but visitors are the ultimate experts on the quality of the experience itself. Therefore, this study asked several questions about personal standards, using generally-accepted question formats. The reader should bear in mind the above caveats when examining these findings. Our questions tended toward the more simple formats that are commonly used; these are easiest to answer but may generate data that has aspects that are difficult to interpret.

One important element of personal standards about conditions is that they are context-dependent. People typically have a different set of ideas about what is preferable, appropriate, or acceptable in developed, front-country settings than in wilderness-type settings (Roggenbuck et

al. 1991). Thus, it was advisable to specify a type of experience when asking questions about standards. (Otherwise, one person might be responding about what should be the case for a wilderness-type experience, while another might be responding about what should be the case for a casual social event river trip.) At the time this study was conceived, the most appropriate setting appeared to be "wilderness," and hence our questions focused on people's ideas about what is acceptable for wilderness-type trips on the river. This seemed reasonable, as many of the commercial outfitters market their trips as wilderness trips, and we found that the large majority of boaters consider the Grand Canyon to be a "wilderness." If, in the future, some other type of experience is to be provided (e.g., family recreation in a semi-natural environment), the data collected here may be of limited use.

Management Standards

Grand Canyon National Park has selected several indicators of experience quality that deal with encounters, and has set standards for each (Figure 5.1). During the high-use season, on the river, there should be an 80% probability of meeting 7 or fewer groups per day, and one should spend no more than 90 minutes in sight of others each day. To evaluate compliance with these standards, it is assumed that "80%" refers to the percentage of days; i.e., the number of days on which one sees more than 7 groups should not exceed 20% of all observation days. (Alternatively, it is possible that the standard implies that 80% of trips should never have a day with more than 7 encounters.) This appears to refer only to on-river encounters (Daily River Encounters in Chapter 3) and not attraction site or camp encounters, which have separate standards. Although it is not stated in the plan, we also assume that the "acceptable number of groups" refers to all groups seen, either on the shore and on the water.

One difficulty in evaluating standards is the length of the day. Standards specify an acceptable maximum of 90 minutes in sight of others per day, but it is not known whether a day is a full 24-hour period, daylight hours, or only the time a group spends on the river.

Hikers are assumed not to be included in encounter standards. There is no management standard for time in close proximity to other groups ("contact" data in Chapter 3). Standards vary some by season, but because most of our data were from the high-use season, and because there were so few differences across months, only the high-use season standards are discussed here.

Figure 5:1 Current NPS Management Standards for Encounters

On the River:

- 80% probability of contacting 7 or fewer groups per day
- 90 minutes or less per day in sight of other groups

At Attraction Sites:

- 80% probability of contacting groups at 70% of the sites
- 100% probability of encounters at Little Colorado River, Elves Chasm, Deer Creek, and Havasu

At Camp:

- 10% probability of camping in sight or sound of another group

Management standards for attraction sites are somewhat more vague. The stipulation about 80% probability of encounters at 70% of sites probably means that, totaling up the proportion of all stops that had encounters by trip, this number is permitted to exceed 70% for no more than 80% of trips. (I.e., one would examine the proportion of trips with encounters on a per-trip basis.) Alternatively, one could examine the probability of encounters on a site-by-site

basis. The standard for camp encounters is interpreted to mean that, across all nights, no more than 10% of nights should be spent camping within sight or sound of another group.

Visitor Standards

Several questions posed to visitors assess the standards of current boaters. Three questions asked boaters about personal standards for wilderness-type experiences on the river. For these, the percentage saying that the number "doesn't matter" was quite low (depending on type of trip, the proportion was 1-12% for number of others camped within sight or sound, 4-15% for number of encounters per day, and 2-10% for percent of time in sight of others), indicating that the issues are important to boaters (Table 5.1). (These findings were described in detail on pages 135-140.)

Table 5.1 displays responses to the question about amount of time in sight of others, which has been asked in other river studies. The proportion saying that such encounters "don't matter" is much lower in the Grand Canyon than on other rivers, while the proportion willing or able to state a number is much higher. This suggests that encounters are a salient issue.

However, it should also be evident that the type of experience used to qualify the question affects the responses given. For example, on the McKenzie, a popular day-use river, 54% said that encounters "don't matter," in a question phrased as applying to "this type of river." On the New River, asking about what would be acceptable for "wilderness" versus "scenic recreation" elicited different answers from a single population of boaters. Because of such differences, and because we only asked about "wilderness" in our study, we cannot be certain how many boaters would have a standard for the type of experience they feel *should* be offered in the Grand Canyon, which might or might not be wilderness. As discussed in Chapter 4, only

40 to 50% of boaters feel that the Canyon should be managed to provide for "wilderness," when "wilderness" was defined as "a place generally unaffected by the presence of people, providing outstanding opportunities for solitude and self-reliance."

Table 5.1 Comparison of Grand Canyon Boaters to Boaters on Other Rivers in Responses to Questions about Standards for Percent of Time in Sight of Others

River and specified setting	Number doesn't matter	Number matters, can't give a specific number	Give a specific number	Mean, those giving number (Std. Dev.)
	----*Percent*----			
Grand Canyon – Wilderness [1]	6	24	70	14 (12)
McKenzie River – This type of river[2]	54	16	30	41
New River – Wilderness[3]	19	21	60	18 (17)
New River – Scenic recreation[3]	30	22	48	32 (21)
Clackamas River – No qualification[4]	21	16	63	49 (22)

[1] "What is the maximum amount of time you would tolerate being in sight of other river parties in a day on the Colorado River in Grand Canyon before it no longer felt like a wilderness experience to you?"
[2]Hall & Shelby (1996). "On this type of river, what is the maximum percent of time it is acceptable to be in sight of boaters from other groups while you are on the river?"
[3]Roggenbuck et al. (1991). Exact wording not reported, but the question appeared to ask what is the maximum acceptable number of groups to see for a wilderness [scenic recreation] whitewater experience.
[4]Hall et al. (1996). "What is the maximum amount of time it would be acceptable to see other boaters before your experience became unpleasant?"

The mean maximum acceptable time in sight is lower on Grand Canyon than for less wild experiences on other rivers. It is remarkably close to the number given by New River boaters (presumably a quite different population, on a much more heavily used river) when asked about "wilderness" experiences. This raises the intriguing possibility that boaters may share a common image of what is appropriate in wilderness. Additional research could help clarify whether wilderness is conceived in a similar way and whether there are shared ideas of what is

appropriate for other types of experiences. Currently, insufficient evidence exists to draw firm conclusions.

Our survey question was not directly comparable to NPS standards, but it is useful to examine the two, bearing in mind various assumptions. First, NPS standards specify that one should not be in sight of others more than 90 minutes per day. Assuming a day is about 10 hours, this would amount to about 15% of the time. This is very close to the mean personal standard for the 70% of Grand Canyon boaters who stated a maximum acceptable for wilderness. Obviously there is considerable variation among respondents (evidenced by a standard deviation of approximately the same magnitude as the mean), and it is not known what would be the limit for the 24% who said encounters matter, but who did not give a number[1]. We also do not know how respondents might have changed their answers if the question had been framed differently, for example, specifying management outcomes that might be entailed by one's answer. Bearing in mind these issues, it appears that the NPS standard is generally in line with what many visitors say is acceptable in a wilderness.

Data for the three "wilderness experience" questions are presented in Table 5.2. According to these measures, among boaters who have standards for the maximum acceptable number of encounters in a day the median number was 2 (private boaters) or 3 (commercial passengers). (Only about 6-8% felt that one should have no encounters at all.) This is somewhat lower than the NPS standard of 7. The question posed to visitors asked about the number of parties seen "in a day on the Colorado River," without specifying river versus attraction sites. Presumably, respondents were indicating the maximum acceptable across all sites. If this is the

[1] Interestingly, though, research by Hall et al. (1996) found that, for three types of encounters, the mean value did not change from a question in which one group of boaters was allowed to select a "matters but can't say" option and another was not given this response option.

case, visitor standards (for a "wilderness experience") are more stringent than existing NPS standards. Again, however, we do not know what standards for experiences other than wilderness would be.

Values for the maximum acceptable number of parties camped within sight or sound are not completely comparable to NPS standards, due to the wording of the question. The question asked "what is the maximum number of other parties that could camp within sight or sound of you on the River before it no longer felt like a "wilderness" experience to you?" We inadvertently did not include any reference to the temporal scope of the question, e.g., "over the entire trip" or "on each night." Respondents may have interpreted the question to refer to the total duration of the trip or to each night, and we are unable to determine which of these occurred. About one-third of respondents said the maximum acceptable was zero, but about two-thirds said it is acceptable to be in sight or sound of at least one other group. If respondents were answering for each night of the trip, they would therefore accept camp encounters more often than is acceptable according to NPS standards – one encounter each night obviously equates to much more than 10% of nights. Since standards for wilderness experiences have always been found to be more stringent than for other experiences, it seems reasonable to assume that if the question had referred to other experiences than wilderness, respondents probably would have stated similar or even more relaxed personal standards. If visitors interpreted the question as referring to a whole trip, and if a typical trip is about 8-12 days, this would amount to a percentage quite close to the NPS standard of 10% of the time.

Table 5.2 Personal Standards for Those Having Standards for Encounters for Wilderness Experiences on the Colorado River

	Motor	Oar	Private
Maximum acceptable daily encounters on the river:			
Mean	4.4	3.4	2.5
Median	3	3	2
% who say zero is maximum acceptable	6	6	8
% who don't care	15	4	4
Maximum acceptable percent of time in sight of other boaters			
Mean	16	13	13
Median	10	10	10
% who don't care	10	3	2
Maximum acceptable number of parties camped in sight or sound for wilderness			
Mean	1.5	1.0	0.9
Median	1	1	1
% who accept no other parties camped in sight or sound for wilderness	32	37	39
% who don't care	12	4	1

The survey data indicate that, for what visitors think would be appropriate for wilderness experiences on the river, NPS standards for time in sight of others during the day are close to what visitors report to be acceptable. On the other hand, visitors would accept fewer total encounters per day than specified by existing management standards. Because of question wording it is not possible to make confident comparisons between visitor and management standards for camp encounters. However, it appears that visitor standards for this type of encounter are either similar to or more relaxed than the NPS standards, depending on how respondents interpreted the question.

Comparison of Observer and Visitor Counts of Encounters

Observational data were collected with the specific intent of evaluating how existing conditions compare to management standards. One obvious question that arises in making such an evaluation is whether observer data provide a valid indication of what visitors experience on the river. Trained observers who diligently attend to all encounters might see more groups than passengers who are occupied with each other or the river, rather than scanning for other trips. Even if boaters saw the same number of groups as observers, they may not remember all encounters, after even a short interval; short or casual encounters might quickly be forgotten. Other research has shown that visitor recollections sometimes underestimate encounters, especially at high numbers (Hall & Shelby 1993; Shelby & Colvin 1982). For these reasons, we asked boaters how many encounters they recalled. Ideally we could compare their recollections to both observer data and to management standards.

It seemed overwhelming to ask visitors to recall the number of encounters they had on every day of their trip. Thus, we asked them to report the number of encounters for the busiest and least busy day of the trip. Our question asked simply "on the day when you saw the greatest [least] number of other trips, how many did you see?" For each respondent, we were able to compute the number of encounters the observer reported for the busiest and least busy day, and compare these figures to visitors' recollections.

Table 5.3 presents the mean number of encounters boaters recalled having "on the day they saw the greatest number of other trips" and "on the day when they saw the least number of other trips." Presumably, these numbers include all encounters, at both attractions and on the river. Therefore, to compare visitor recollections with observer data, some adjustments to observer data were needed. Recall that observers recorded encounters separately on the river, at

attraction sites, and at camps. For each day of each trip, these encounters were summed, to generate a grand total number of encounters per day. It was not known whether respondents would count multiple encounters with the same trip as more than one encounter – the question phrasing was vague in this regard. Data in Table 5.3 represents observer data for all encounters, where each additional sighting of the same group was counted as another encounter. In order to compare directly with visitor data, each respondent was assigned the number of encounters recorded by the observer accompanying the trip.

Table 5.3. Comparison of Observer Data and Visitor Recollections of Encounters

	Motor	Oar	Private
	----*Number of Groups*----		
Observer data[1] – Mean maximum (river + attraction + camp)	13.3	11.2	13.7
Visitor recollections – Mean for busiest day	5.0	4.7	6.1
Observer data – Mean minimum (river + attraction + camp)	3.0	1.8	0.5
Visitor recollections – Mean for least busy day	1.3	0.8	1.0

[1]Each respondent was assigned the number of encounters recorded by the observer accompanying the trip.

Observers reported much higher numbers of encounters on the busiest day than passengers. For example, on motor trips, observers reported that the average number of encounters on the busiest day was 13, whereas the average reported by visitors was only 5. Private boaters appeared to be somewhat more accurate in their recollections than commercial oar passengers, but not much more so. All respondents reported minimum numbers of encounters that were closer to what observers recorded. Interestingly, the pattern of visitors

recalling fewer encounters than observers was reversed for private boaters for data on the least busy day.

In this analysis, we assumed respondents interpreted the question as referring to all encounters, regardless of location. It is possible, though unlikely, that visitors interpreted the question as referring to unique encounters and actually responded that way. (However, it seems unlikely that respondents would consistently remember which groups they had seen before and consciously subtract out multiple encounters.) As reported in Chapter 3, about 40% of all encounters were repeat encounters. Thus, even if we subtract out repeat encounter from observer data and then compare numbers to visitor recollections, visitor numbers would still be generally below observer data.

The rather large difference between observer and visitor reports is important. Presumably, management standards for things like encounters are designed to protect the visitor experience, and in one sense it seems logical that the appropriate measure of encounters to use is the one visitors report. That is, if encounters affect the sense of solitude and other aspects of experience quality, as the indicator-and-standard approach presumes, it ought to be the encounters a person recalls that affect the experience, rather than the encounters someone else says they had. It would seem inappropriate, for example, to tell a person who believes s/he saw no one else (and therefore felt a sense of solitude) that in fact they had encounters with other groups and there fore could not have felt solitude. Thus, it is important to ground truth indicators and standards with visitors themselves.

Obtaining input from visitors is difficult, but appears necessary to validly evaluate whether conditions are within standards. Ideally, we would have both types of data.

Unfortunately, we do not have visitor recollection data for comparison with all NPS standards, and must use observer data in the following analyses.

Comparison of Encounter Data to Standards for Encounters

It is desirable to be able to compare visitor responses (views on the acceptable number of encounters and recollections of encounter rates) to existing management standards laid forth in the CRMP. There are some difficulties in doing so, however. Like many plans, the CRMP states standards in terms that require some assumptions in order to apply them. For instance, the plan does not state whether all encounters with all groups should be counted equally, rather than counting only unique groups contacted. Additionally, the CRMP does not specify clearly what type of experience is to be provided on the river.

One very important concern is whether the standard for river encounters subsumes encounters at attraction sites and camps. We assume that it does not, primarily because the river management plan standards were based on Shelby and Nielsen's research in 1975, which used the same categories as used in this study. In that research, river encounters explicitly did not include attraction or camp encounters. The following analysis would change substantially for river encounters (but not for attraction sites or camps) if data for attraction sites and camps were added to data for river encounters when examining compliance with standards.

River Encounters

The management standard for river encounters stipulates that there should be an 80% probability of encountering 7 or fewer groups per day while on the river, which we assume

excludes encounters at camp and at attraction sites. By this measure, using observer data, motor trips had a slightly higher occurrence of encountering more than 7 groups each day than is acceptable (Table 5.4). However, commercial oar and private trips were well within this standard; less than 10% of the days had encounters with more than 7 groups. (In these evaluations, all encounters with others, including multiple sightings of the same group, are included.)

We did not have visitor data for each day of the trip (rather, we had data for just the busiest and least busy days), so it is not possible to directly evaluate compliance with management standards on the basis of visitor data. However, it is possible to draw some inferences. Ninety percent of motor passengers, 83% of oar passengers, and 79% of private boaters said that on the busiest day they saw 7 or fewer groups. We can assume then, because these numbers were the maximum recalled, that for these respondents, *every* day of the trip was within NPS standards.

Table 5.4 Number of Daily River Encounters in Comparison to Standards, Per Day Basis

	Motor (n=157)	Oar (n=214)	Private (n=131)
% of days with ≤7 encounters with other groups on the river, but not including attractions or camps[1]	73	94	91
% of visitors saying busiest day had ≤7 encounters with other groups[2]	90	83	79
Mean number of groups per day[1]	5.1	3.0	3.0
In compliance with management standards?[3]			
On the basis of observer data	No	Yes	Yes
On the basis of visitor recollections	Yes	Yes	Yes

[1]Observer data

[2]Survey data

[3]Given assumptions that: 1) attraction site and camp encounters are not part of river encounters; 2) repeat encounters with the same group are included.

From these data, one would conclude that the commercial oar and private trips are comfortably within standards for river encounters, using the NPS standards. Motor trips appear to be slightly, but not far, out of compliance. Relying on visitor data for motor trips, one would conclude that the number of encounters is within standards for this group as well.

An alternate way to examine these data is to take a trip-level perspective. That is, rather than looking at the probability of encountering more than 7 groups on any given day, one could ask what proportion of trips had 7 or fewer encounters on at least 80% of their days. These data are presented in Table 5.5. By this analysis, commercial oar trips and private trips are well within standards, but 41% of commercial motor trips had more than 7 encounters more often than acceptable.

Table 5.5 Number of Daily River Encounters in Comparison to Standards, Per Trip Basis

	Motor	Oar	Private
Never had a day with >7 encounters on river	32% (7 trips)	53% (9 trips)	75% (6 trips)
Had 1-20% of days with > 7encounters on river	27% (6 trips)	47% (8 trips)	13% (1 trip)
Had >20% of days with >7 encounters on river	41% (9 trips)	0% (0 trips)	13% (1 trip)
Total	100% (22 trips)	100% (17 trips)	100% (8 trips)
In compliance with management standards?[1]	No	Yes	Yes

[1]Given assumptions that: 1) attraction site and camp encounters are not part of river encounters; 2) repeat encounters with the same group are included.

For time in sight of other groups, the Park standard is 90 minutes or less per day while on the river. All trip types appeared to meet this standard, with only 2 to 7% of all days exceeding

this number (Table 5.6). If the mean time in sight (about 30 minutes) is translated into a percentage, for comparison with visitor standards, it amounts to about 5% of the time in sight of others (assuming a 10-hour day).

Table 5.6 Total Time in Sight (Minutes) During River Encounters in Comparison to Standards (Observer Data)

	Motor (n=157)	Oar (n=214)	Private (n=131)
% days with < 90 minutes in sight of others	94	93	98
Mean, percent of time in sight of others	34	33	27
In compliance with management standards?[1]	Yes	Yes	Yes

[1]Given assumptions that: 1) attraction site and camp encounters are not part of river encounters; 2) repeat encounters with the same group are included.

Attraction Site Encounters

According to management standards, there should be no more than an 80% probability of having contacts at 70% of the sites. Across all stops, boaters encountered others at just over half of the attractions (Table 5.7) This appears to be well below the 70% standard. Indeed, only a few individual locations exceeded the standard (i.e., more than 80% of stops there involved in encounters).

Table 5.7 Attraction Site Encounters in Comparison to Standards (Observer Data)

	Motor	Oar	Private
Mean number of stops per trip (standard deviation)	11.8 (3.18)	15.9 (4.15)	18.9 (6.81)
% of attractions at which encounters occurred	54	50	55
In compliance with management standards?[1]	Yes	Yes	Yes

[1]Given assumptions that observer data are appropriate basis for this assessment

Park standards specify different levels of acceptability for encounters at four high use attractions versus other attractions. To evaluate the standard for the four high use attractions, we computed how many of the four stops were occupied by others during each trip's visits (Table 5.8). Of course, not all trips stopped at all four sites (26 of the 47 trips did so), so we computed the rate based on those sites at which trips did stop. (Forty-two trips visited at least three of the four sites.) Despite the high probability of encounters at individual sites, especially Deer Creek, the combined probability of encountering others at all four stops was only 41-59%.

Table 5.8 Encounters at High-Use Attractions in Comparison to Standards

	Motor	Oar	Private
Probability of having an encounter at		*----Percent----*	
Little Colorado River	81	75	50
Elves Chasm	50	50	86
Havasu	95	100	100
Deer Creek	96	86	100
Probability of having encounters at all of the high-use destinations at which one stopped	41	59	50

Camp Encounters

NPS standards for encounters at camps allow only 10% of nights to be spent in sight or sound of others. By this measure, all trip types were out of compliance with standards, though not to a great degree (Table 5.9). Rather than 10% of nights in sight or sound of others, the actual rate was closer to 20%.

Table 5.9 Encounters at Camps in Comparison to Standards

	Motor	Oar	Private
Probability of having a group camped in sight or sound on any given night	22%	17%	21%
In compliance with management standards?	No	No	No

Conclusions

Contrasting Observer and Visitor Data on Encounters

The large differences between observer data and visitor recollections poses potential difficulties for monitoring and for evaluating compliance with standards. It appears that visitors recall seeing fewer other groups than observers document. We only asked visitors to recall the "number of other parties seen on the busiest [least busy] day" of their trip, and cannot evaluate how well they would recall encounters at attractions and camps versus encounters on the river. It seems probable that recall of the occurrence of encounters at attractions (whether one saw others there or not) would be quite accurate. However we have no data from which to test this, and it also seems likely that visitors' recollections of total numbers of people present at attractions might be poor.

We believe that the most appropriate measure of visitor experience quality is visitors' own recollections. If people genuinely did not see other groups, or saw them but did not recall doing so, it seems inappropriate to infer that such "encounters," as documented by observers, adversely affected their experiences. This suggests that the NPS may need to consider monitoring strategies that involve talking directly to boaters. Alternatively, and possibly less desirably, they might examine the relationship between observer data and visitor recollections, to

ascertain whether a strong, predictive relationship exists. If it does, one might be able to infer visitor information from observer data.

Variability in Encounters During Trips

One point became clear in examining encounter data for Grand Canyon trips: the number of encounters one has is highly variable across and during days. One might have an extremely "crowded" experience at Deer Creek, but then spend two full days out of sight of any other groups at another point in the trip. Indeed, about 40% of all visitors reported having a day with no encounters.

Existing NPS standards do not appear to take such variability into account; every day is treated as every other day. It might be desirable to craft standards that explicitly recognize the trade-offs between occasional high-encounter and occasional low-encounter days. For example, a standard might specify that 30% of all boaters should have a day with no encounters. If this occurs, it might be acceptable to have 20% of days with larger numbers of encounters.

Similarly, the standard for time in sight of others treats all minutes during the day the same. If one spends 90 minutes in sight of others in the morning, but out of sight of all others in the afternoon, this is considered the same as if one sees others for a few minutes each time, several times throughout the day. Little is known about the effects of the way encounters are distributed through time, but the point seems worthy of discussion.

Chapter 6: Changes Since 1976

Several questions asked in the 1975 study were replicated in the 1998 survey. The methods of data collection (sampling of trips and distribution of questionnaires) was carefully matched, in order to permit analysis of changes over time. It is rare in recreation studies to have an opportunity to conduct longitudinal research, and especially rare to have such a long interval between studies. This chapter identifies similarities and differences between current Grand Canyon boaters and those who ran the river during the mid-1970s.

The original data files from the 1975 study are no longer available, but much of the data was presented in reports by Shelby et al. (1976). Wherever possible, precise comparisons were made. However, in some cases, commercial oar and motor trip passengers were combined in the 1975 analysis. Thus, there is some lack of parallelism between the two sets of data.

Use Levels and Encounters

Changes in Use Levels and Samples

Use of the Colorado River – both total numbers and distribution across time – has changed dramatically (Table 6.1). In 1975, there were 562 trips down the river from Lees Ferry. The majority of these were commercial motor trips. In 1998, there were usually more than six launches per day, for a total of 913 trips. The types of trip have also changed. In contrast to the very small number of private trips in 1975, by 1998 there were eight private launches every week.

Table 6.1 Changes in Use Levels, Colorado River through Grand Canyon

		Motor	Oar	Private	All
Total number of trips	1975	437	80	45	562
	1998	498	155	260	913

Changes in the distribution of use are reflected in changes in the sampled trips. About the same number of trips were randomly sampled in each year, and the differences in distribution across motor and oar trips reflect changes in the relative proportion of each type of trip (Table 6.2).

Table 6.2 Number of Trips Sampled, 1975 vs. 1998

		1975	1998
Trip Types	Motor	32	22
	Oar	7	17
	Private (oar)	7	8/10[1]
Respondents	Motor	702	465
	Oar	127	443
	Private	117	124

[1]Eight trips were sampled for observer data. Ten trips were sampled for survey data.

Changes in Encounters

Although use levels have increased substantially overall, the number of encounters per day has increased only slightly (Table 6.3). Private boaters have experienced almost no increase,

and commercial passengers on average have about one more encounter per day than in 1975. The number of people seen per day has remained constant over time.

The number of boats seen has risen substantially, but this is confounded by the types of boats used on the river today. More trips in 1998 had hard-shell or inflatable kayaks, and each of these counted as a separate boat. This probably explains changes in the numbers of boats over time.

Table 6.3 Changes in Encounters, from 1975 to 1998

		Motor	Oar	Private
Number of river contacts/day	1975	2.2	3.8	2.8
	1998	3.0	5.1	3.0
People seen per day on river	1975	44	81	61
	1998	46	81	55
Time in sight of others per day	1975	28	41	41
	1998	33	35	27
Boats seen per day on river	1975	9.7	5.4	na
	1998	11.0	17.4	10.7
Mean length of average contact (within earshot)	1975	14.1	10.2	na
	1998	8.4	6.6	4.5

Interestingly, the amount of time in sight of others has actually gone down for commercial oar and private trips, and remained basically constant for commercial motor trips. Similarly, the time in contact (mean length of time within speaking distance per encounter) has declined, at least for commercial passengers. (No data are available for 1975 private boaters on this variable.) These data suggest that trip leaders have become more aware of the effect of

encounters, and make an effort to avoid them. This is consistent with what we observed on the river and what we were told by commercial guides.

Trips today make about the same number of stops as they did in the past (Table 6.4). Private boaters are largely similar now to boaters in 1975 in the total number of stops. However changes are evident in the length of time trips stay at each attraction, especially for rowing trips. The largest change was for commercial oar trips – the mean length of stops was 6 hours in 1975 but only 1.5 hours in 1998.

Table 6.4 Changes in Number and Length of Attraction Stops, 1975 to 1998

		Motor	Oar	Private
Total Number of Attraction Stops	1975	12.1	17.0	21.3
	1998	11.8	15.9	18.9
Mean Length of Attraction Stop	1975	1.3	6.0	3.9
	1998	2.1	1.5	1.7

The likelihood of seeing others at attractions has remained relatively constant (Table 6.5). However, the probability of meeting others at three of the four major attractions has increased, when data are examined on a site-by-site basis. This suggests, consistent with conventional wisdom on the river, that guides are better able to work out travel amongst themselves to avoid long encounters on the river, but are less able to avoid encounters at attraction sites. Interestingly, however, the likelihood of seeing people at every one of the four stops during a single trip has actually decreased substantially.

Table 6.5 Changes in Attraction Site Encounters, 1975 vs. 1998

	1975	1998
% Sites with contacts	46	50-55
Probability of contact at		
Little Colorado	.63	.73
Elves Chasm	.63	.56
Deer Creek	.67	.94
Havasu	.85	.97
All 4 attractions	.70	.48
Mean number of people at		
Little Colorado	36	38
Elves Chasm	30	20
Deer Creek	27	50
Havasu	58	47

Visitor Characteristics

Sociodemographic Characteristics

Some notable changes have occurred in the sociodemographic characteristics of Grand Canyon boaters since 1975 (Table 6.6). The mean age of boaters has increased from around 30 to 43, possibly mirroring the aging of the American population or the river-running cohort. The proportion of boaters who are married has gone up among commercial boaters. (Data are not available to examine changes among private boaters.) The proportion of women in the samples increased slightly among private boaters, but actually declined slightly among commercial passengers.

The proportion of private boaters belonging to a conservation or outdoor organization has remained around 60%, and the proportion of motor passengers belonging to such organizations has increased only from 22 to 27%. However, among commercial oar passengers, the percentage rose from 22% in 1975 to 44% in 1998. If membership indicates anything about environmental or other values, these changes would lead us to expect more change among commercial oar passengers than among the other groups.

Table 6.6 Changes in Sociodemographic Characteristics between 1975 and 1998

	Year	Commercial	Private
Mean age (years)	1975	33	28
	1998	43	43
% married	1975	43	Not available
	1998	62-66	68
% Women	1975	48	23
	1998	43	33
Membership in organizations	1975	22	57
	1998	27-44	62

Changes in River Use Histories

In 1975, few boaters had previously run the Colorado River through Grand Canyon (Table 6.7). Although 30% of private boaters had made previous trips, only 9% of commercial passengers had done so. The situation was much different in 1998, primarily because of changes among private boaters. Slightly more commercial passengers in 1998 had previous Grand Canyon trips than was true in 1975, but by 1998 the majority of private boaters had made

previous trips. In fact, in 1998, nearly one-quarter of private boaters had made three or more trips down the river.

Table 6.7 Change in Number of Past Trips on the Colorado River in the Grand Canyon, 1975 vs. 1998

		Motor	Oar	Private
		-----Percent-----		
None	1975	91		70
	1998	82	79	39
1	1975	6		15
	1998	12	14	23
2	1975	2		8
	1998	2	3	14
3+	1975	1		7
	1998	3	4	24

Table 6.8 Change in Number of Past Trips on the Other Rivers, 1975 vs. 1998

		Motor	Oar	Private
		-----Percent-----		
None	1975	66		3
	1998	38	27	6
1	1975	17		9
	1998	22	17	2
2	1975	9		15
	1998	22	28	7
3+	1975	8		72
	1998	19	28	86

In 1975, most private boaters had some experience on other rivers, and the same was true of private boaters in 1998 (Table 6.8). On the other hand, 66% of commercial passengers in 1975 had never been on a trip on another river, and the Colorado River in Grand Canyon was the first river trip for these people. By 1998, commercial passengers had developed significantly

more experience with rivers in general; 73% of oar and 62% of motor passengers had taken trips on other rivers.

Wilderness Experience

Boaters were asked "how many years ago did you go on your first wilderness-type trip?" The Grand Canyon trip was not the first trip for nearly all private boaters, either in 1975 or in 1998 (Table 6.9). However, among 1975 commercial passengers, 31% said their river trip was the first wilderness trip they had ever taken, while 43% in 1975 said they had taken their first such trip at least six years previously. The 1998 commercial passengers were more experienced according to this measure, with about 70% in the most experienced class.

Table 6.9 Change in Time Since First Wilderness Experience, 1975 vs. 1998

		Motor	Oar	Private
		-----Percent-----		
This is first	1975	31		2
	1998	18	12	0
Less than 1 year	1975	Not available[1]		
	1998	8	7	1
1-2 years[2]	1975	5		9
	1998	9	8	2
2-3 years ago	1975	9		8
	1998	7	5	0
4-5 years ago	1975	11		6
	1998	7	5	2
6+ years ago	1975	43		76
	1998	69	74	96

[1]This category was accidentally omitted from the 1975 survey.
[2]Item on 1975 survey was "1 year ago."

Preferences for Colorado River Trips

Boaters in each group in 1998 were almost identical to those in 1975 in their preferences for taking motor or oar trips (Table 6.10). Data from 1975 on preferred trip size were presented in the 1976 report only for all trip types together (Table 6.11). At that time, 57% preferred to run the river with small groups and 29% with medium-sized groups. In 1998, a majority of all groups (56-100%) preferred the smaller groups.

Table 6.10 Preferences for Running the River with Motorized or Oar Trips, 1975 vs. 1998

		Motor	Oar	Private
		-----Percent-----		
Prefer an oar trip	1975	15	98	98
	1998	10	93	99
Prefer a motorized trip	1975	61	1	0
	1998	62	3	0
Makes no difference	1975	25	2	2
	1998	28	4	1

Table 6.11 Preference for Running the River with Different Sized Groups, 1975 vs. 1998

		Motor	Oar	Private
		-----Percent-----		
Prefer a small group (20 persons or less)	1975	57		
	1998	56	81	100
Prefer a medium sized group (20-30 persons)	1975	29		
	1998	27	17	0
Prefer a large group (30-40 persons)	1975	4		
	1998	4	0	0
Makes no difference	1975	11		
	1998	13	2	0

Changes in Perception of Conditions Encountered in the Canyon

Wilderness Qualities

Several items asked boaters to evaluate wilderness-like qualities in the Grand Canyon. Table 6.12 (and Figures 6.1 to 6.5) presents the proportion who agreed (+1 or +2 on the 4-point scale) with each statement. Interesting patterns emerge from these responses. Motor trip passengers in both time periods almost unanimously agreed that the canyon was relatively unaffected and could be considered a "wilderness." They uniformly disagreed that the canyon was too crowded to be considered a "wilderness," and only 20 and 40% agreed that the canyon would be more of a wilderness if use were more restricted or motor trips were banned. The consistency in responses over time among motor passengers is remarkable.

A very different pattern is evident in the responses of private boaters. In 1975, this group was least likely to say the canyon was relatively unaffected (46% agreed), although 87% would consider it a wilderness. They were more likely to agree that the feeling of wilderness would be enhanced by additional restrictions on use and, especially, prohibition of motor travel. By 1998, these "wilderness purist" sentiments were even stronger. Only 37% said the canyon seemed relatively unaffected by people, and only 56% would consider the Grand Canyon a "wilderness." Changes in the percent agreeing with statements about use limits and crowding were less dramatic, but in the same direction as other changes.

Private boaters changed in their evaluation of the current condition – becoming less likely to think of the canyon as wilderness. Motor passengers changed in their evaluation of the effect of use restrictions and a motor ban on wilderness – becoming less likely to think that either change would make the canyon more of a wilderness.

Table 6.12 Agreement with Statements about Wilderness Qualities in the Grand Canyon

		Motor	Oar	Private
		-----*Percent*-----		
The canyon seems relatively unaffected by the presence of man	1975	82	65	46
	1998	82	73	37
I would consider the Grand Canyon area of the Colorado River a "wilderness"	1975	91	93	87
	1998	93	91	56
The canyon would be more of a wilderness if use were more restricted	1975	39	64	55
	1998	29	45	57
The canyon would be more of a wilderness if motor travel were banned	1975	35	80	91
	1998	24	74	85
The canyon is too crowded to be considered "wilderness"	1975	13	20	41
	1998	11	17	50

Figure 6.1 Agreement that the Canyon Seems Relatively Unaffected by Presence of Man

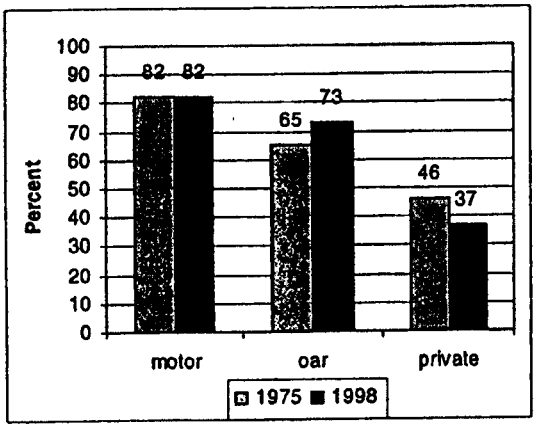


Figure 6.2 Agreement that the Grand Canyon is a "Wilderness"

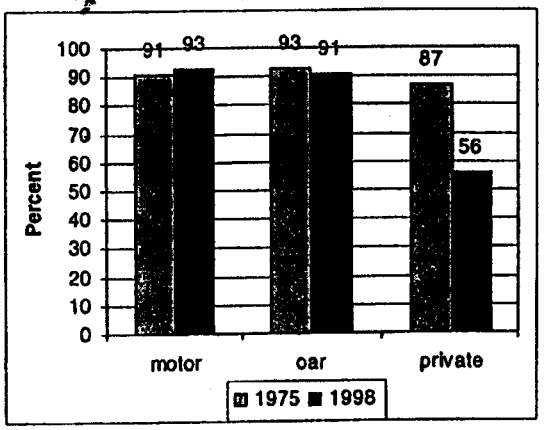


Figure 6.3 Agreement that the Canyon Would Be More of a Wilderness if Use Were More Restricted

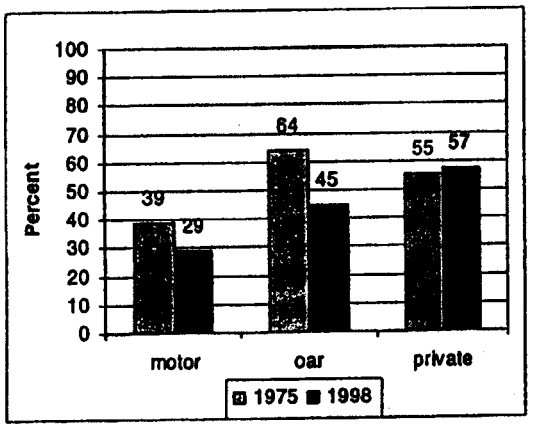


Figure 6.4 Agreement that the Canyon Would be More of A Wilderness if Motor Travel Was Banned

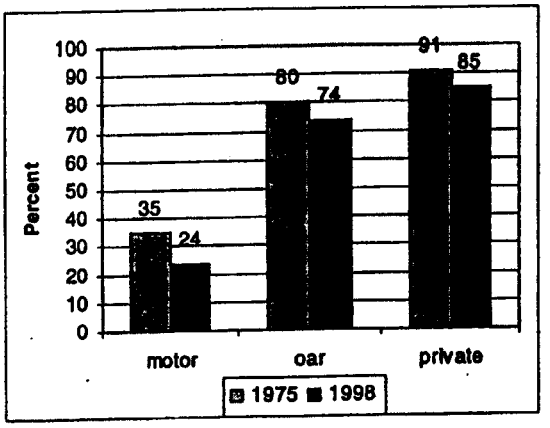
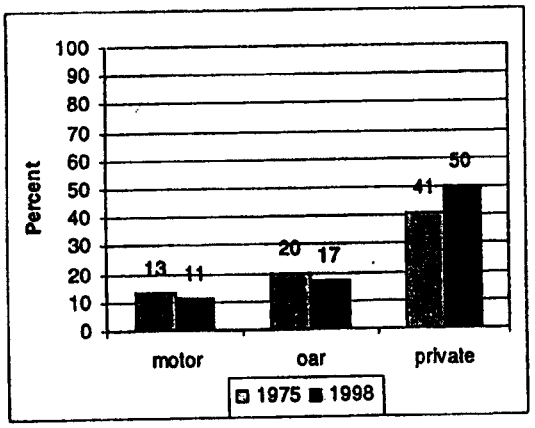


Figure 6.5 Agreement That the Grand Canyon is Too Crowded to Be Considered Wilderness



Oar passengers in 1975 were mostly intermediate between motor passengers and private boaters in their feelings about wilderness qualities in Grand Canyon. Although this group was most likely to agree that the canyon would be more of a wilderness is use were more restricted, 65% agreed that the canyon seemed relatively unaffected, and 20% agreed that the canyon was too crowded to be considered a wilderness. At that time, oar passengers were quite similar to private boaters in their views about the influence of banning motors on the feeling of wilderness.

By 1998, oar passengers had become somewhat more like motor passengers and less like private boaters. For example, there was an increase in the proportion agreeing that the canyon seemed relatively unaffected by people and a marked drop in the proportion agreeing that the canyon would be more of a wilderness if use were more restricted.

Perception of Environmental Impacts

Related to the questions about wilderness qualities were several items about perception of environmental impacts in the Canyon. The question asked respondents to "please indicate the degree to which you agree that each of the following environmental damage conditions exists in the Grand Canyon." The percentage agreeing to each item is presented in Table 6.13 and Figures 6.6 to 6.10. Motor passengers in both time periods were least likely to feel that impacts existed, and more than 80% felt that the environment was not being damaged by overuse. There was no change over time among those on motor trips.

Table 6.13 Perception of Environmental Impacts, 1975 vs. 1998

		Motor	Oar	Private
		-----Percent-----		
Excessive litter exists in the GC	1975	8	21	24
	1998	4	5	25
Trampling of natural vegetation exists in the GC	1975	14	31	38
	1998	14	18	47
Overuse of campsites exists in the GC	1975	15	37	31
	1998	9	12	41
Overuse of visitor attraction sites exists in the GC	1975	22	44	48
	1998	23	31	67
The GC environment is not being damaged by overuse	1975	90	53	43
	1998	81	70	42

Private boaters displayed the same trend toward "purism" that they had exhibited in the wilderness questions. For example, in 1975, 38% felt trampling of vegetation occurred, but this percentage was 45% in 1998. Similarly, the percentage feeling that attraction sites are overused increased from 48 to 67%. However, the percentage of private boaters saying the Grand Canyon is not being damaged by overuse remained constant over time, at 42-43%.

The tendency of commercial oar trip passengers to become more like commercial motor trip passengers was even more evident in these questions. For example, 21% said that excessive litter existed in 1975 (about the same proportion as among private boaters), but this had dropped to 5% by 1998. The proportion believing campsites to be overused declined from 37 to 12%, and the proportion saying the canyon is not being damaged rose from 53 to 70%.

Developments

Four items asked about developments and conveniences (Table 6.14). There were no significant changes over time for any of the three groups. Boaters continue to feel that new developments should not be built, and few would have preferred more conveniences or facilities.

Table 6.14 Evaluation of Level of Development and Facilities, 1975 vs. 1998

		Motor	Oar	Private
		-----Percent-----		
They should build an aerial tramway into the canyon so more people could enjoy it	1975	8	4	0
	1998	9	6	5
More developments like Phantom Ranch should be build along the river	1975	11	6	3
	1998	10	7	4
I would have preferred to have more of the conveniences of home	1975	11	5	3
	1998	15	12	2
I would have enjoyed the trip more if we had had better camping facilities	1975	14	5	2
	1998	12	11	2

Preferences for and Evaluations of Encounters

In both studies, several questions were asked about encounters. The 1975 data about preferred number of encounters were presented for all respondents together (Table 6.15), and separately for commercial passengers (Table 6.16). At that time, about one-third of all passengers (and 38% of commercial motor and 54% of commercial oar passengers) preferred to see no one, about 45% preferred to have between one and three encounters per day with other groups, and about one-quarter preferred four or more encounters (Table 6.15). In 1998, 25% of motor passengers preferred no encounters, compared to about 45% of commercial oar passengers and private boaters. In general, there appears to be little change in preferences for encounters.

Table 6.15 Preferences for Encounters Per Day, 1975 vs. 1998

	1975	1998		
	All	Motor	Oar	Private
	-----Percent-----			
None	34	25	46	44
1	15	9	14	14
2	16	17	16	19
3	13	22	11	16
4	7	9	5	3
5	8	10	7	3
6-10	6	5	1	2
11-20	2	2	0	0

Table 6.16 Differences Between Commercial Motor and Oar Trip Passengers in 1975 in Preference for Encounters

	Motor	Oar
	-----Percent-----	
None	38	54
1-2 other groups	28	27
3 or more other groups	34	19

In 1975, most commercial passengers expressed a preference for camping out of sight and sound of all other groups (Table 6.17). In 1998, a majority still felt this way, but the percentage had dropped markedly, especially among commercial motor passengers. This suggests a greater acceptance of (or perhaps preference for) camp encounters, at least among commercial passengers, in 1998.

Table 6.17 Preferences for Camping Alone Versus Near Another Group, 1975 vs. 1998

		Motor	Oar	Private
		-----Percent-----		
Prefer to Camp Alone	1975	89	98	na
	1998	64	76	77

In preferences for meeting oar versus motorized trips, respondents were remarkably consistent over time (Table 6.18). Most commercial oar and private boaters have always preferred to meet oar trips. Most motor trip passengers, on the other hand, have always been indifferent.

Table 6.18 Preference for Meeting Oar Versus Motorized Trips on the River, 1975 vs. 1998

		Motor	Oar	Private
		-----Percent-----		
Prefer to meet oar trips	1975	18	92	92
	1998	13	84	93
Prefer to meet motorized trips	1975	9	7	8
	1998	6	0	1
Makes no difference	1975	73	2	1
	1998	81	16	7

The survey s in both years included several statement evaluating encounters. These responses show that over time, commercial passengers have become less sensitive to encounters (Table 6.19). For example, in 1975, 32% would have enjoyed the trip more if they had seen fewer other groups at side stops, compared to 25% in 1998. Similarly, while 27% would have enjoyed the trip more if they had seen fewer other trips while on the river, 19% gave this response in 1998. Private boaters, on the other hand, became significantly more sensitive to encounters over time. While 48% said they had to share attractions too often in 1975, 66% did so in 1998. For private boaters, the greatest change appeared to be in their evaluation of conditions at attraction sites. Commercial oar passengers became more like commercial motor passengers over time.

Table 6.19 Evaluations of Social Conditions, 1975 vs. 1998

		Motor	Oar	Private
		-----Percent-----		
Too often we had to camp near other parties	1975	6	9	11
	1998	6	9	20
I don't think we met too many people during our trip down the river	1975	71	63	62
	1998	83	78	53
Too often we had to share a place like Deer Creek Falls with other groups	1975	24	28	48
	1998	23	29	66
I would have enjoyed the trip more if we had seen less people at side stops	1975	32	48	54
	1998	25	44	73
I would have enjoyed the trip more if there hadn't been so many boats going by	1975	21	48	56
	1998	14	33	53
I would have enjoyed the trip more if we had seen less people while floating on the river	1975	27	52	51
	1998	19	41	60

References Cited

Cordell, H. K., Betz, C. J., Bowker, J. M., English, D. B. K., Mou, S. H., Bergstrom, J. C., Teasley, R. J., Tarrant, M. A., & Loomis, J. (1999). *Outdoor recreation in American life: A national assessment of demand and supply trends.* Champaign, IL: Sagamore Publishing.

Hall, T. E., & Roggenbuck, J. W. (1998). *Cultural models of "wilderness".* Paper presented at the Seventh International Symposium on Society and Resource Management -- Culture, Environment, and Society. May 27-31, 1998, Columbia, MO.

Hall, T., & Shelby, B. (1993). *Monitoring encounters in wilderness. Report submitted to Intermountain Research Station.*: Oregon State University.

Hall, T. E., & Shelby, B. (1996). *McKenzie River boater study. Report prepared for McKenzie Ranger District, Willamette National Forest and Eugene District BLM.*

Hall, T. E., Shelby, B., & Rolloff, D. (1996). Effect of varied question format on boaters' norms. *Leisure Sciences, 18,* 193-204.

Hendee, J. C., Catton, W. R., Marlow, L. D., & Brockman, C. F. (1968). *Wilderness users in the Pacific Northwest: Their characteristics, values, and management preferences* (Res. Pap. PNW-61): USDA Forest Service, Pacific Northwest Research Station.

Manning, R. E. (1986). *Studies in outdoor recreation: Search and research for satisfaction.* Corvallis, OR: Oregon State University Press.

Roggenbuck, J. W., Williams, D. R., Bange, S. P., & Dean, D. J. (1991). River float trip encounter norms: Questioning the use of the social norms concept. *Journal of Leisure Research, 23*(2), 133-153.

Shelby, B., & Colvin, R. (1982). Ecounter measures in carrying capacity research: Actual, reported, and diary contacts. *Journal of Leisure Research, 14*(4), 350-360.

Shelby, B., & Heberlein, T. (1986). *Carrying capacity in recreation settings.* Corvallis, OR: Oregon State University.

Shelby, B. and J. M. Nielsen (1976). Private and commercial trips in the Grand Canyon. River contact study final report, part IV. Project report for Grand Canyon National Park.

Shelby, B., Vaske, J. J., & Heberlein, T. A. (1989). Comparative analysis of crowding in multiple locations: Results from fifteen years of research. *Leisure Sciences, 11,* 69-291.